# RUBBER WORLD

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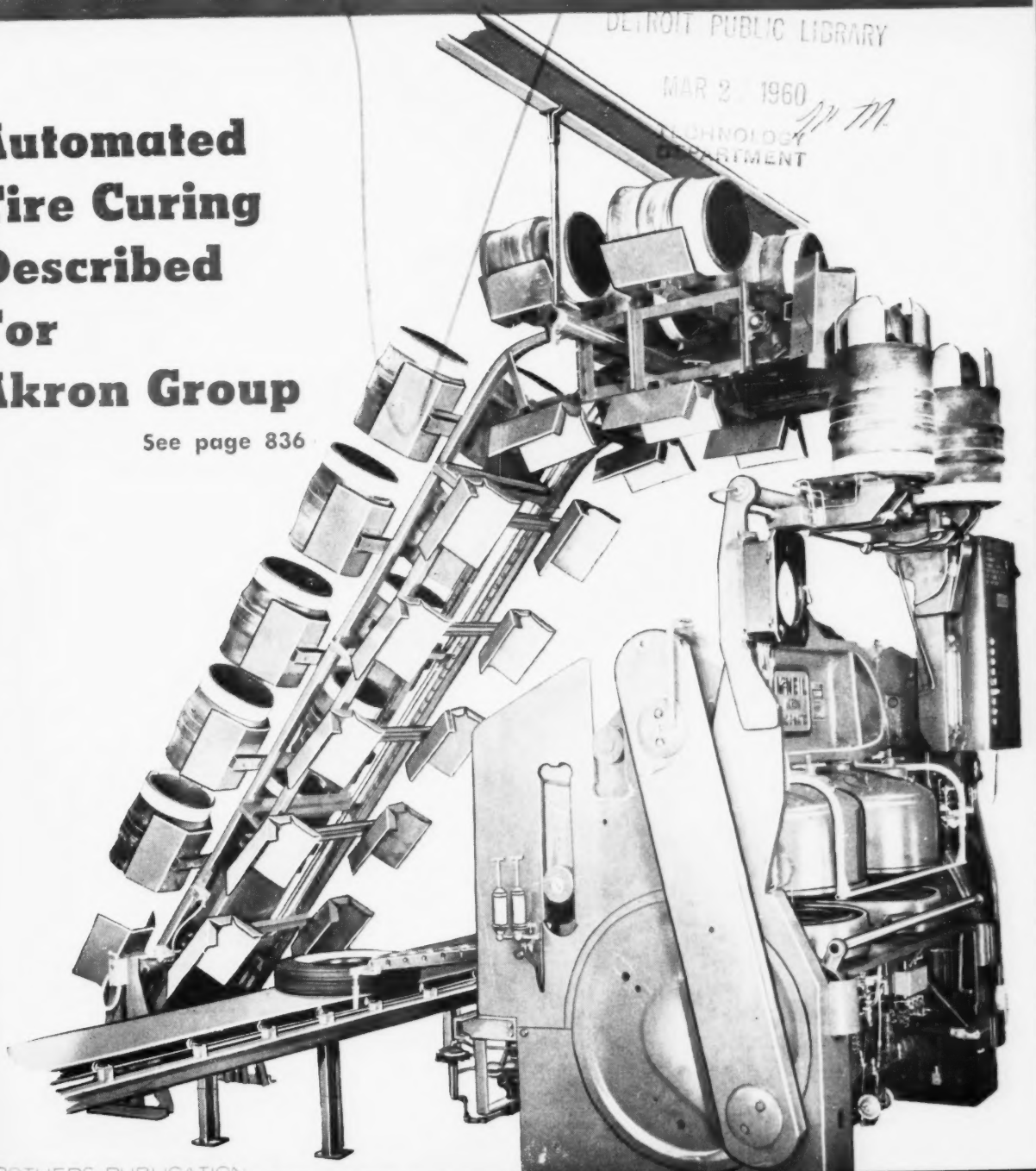
## Automated Tire Curing Described For Akron Group

See page 836



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# RUBBER WORLD

## ARTICLE HIGHLIGHTS

**NEED OF MORE TECHNICAL NR TESTING?**

The growing interest in evaluating natural rubber on a more technical basis than that provided by the present visual inspection standards seems to be worldwide. It should be considered, therefore, at international conferences on NR packing and quality. **813**

**STREAMLINING THE "MILL ROOM OF THE SIXTIES"**

Present-day labor and equipment costs for rubber processing may be reduced by the use of new techniques in the mill room, which introduce a newly developed, high-speed, automatic two-roll mill in place of internal mixers and pelletizers. **815**

**TIRE REPAIR MATERIALS SHELF LIFE ESTIMATED**

The storage stability of unvulcanized tread rubber and tire repair materials may be estimated by air-oven aging at 150° F., or at 125° F. if a longer period of time is available for such testing. Certain federal specifications require 12 months' storage stability. **820**

**HOW TO ELIMINATE "VITON" HOSE BLISTERING**

The blistering of high-pressure, high-temperature hydraulic hose made of "Viton" A was eliminated by the use of a higher molecular weight polymer and the proper choice of compounding ingredients. **827**

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VOLUME 141, NUMBER 6 MARCH, 1960

# CONTENTS

**NATURAL RUBBER TESTING; MORE TECHNICAL APPROACH DEVELOPING**

. . . . . An editorial by R. G. Seaman 813

**NEW RUBBER PROCESSING TECHNIQUES FOR THE SIXTIES**

. . . . . Andrew Hale 815

**STORAGE STABILITY OF TREAD RUBBER AND TIRE REPAIR MATERIALS**

. . . . . R. D. Juve and F. M. Johnson 820

**COMPOUNDING "VITON" FOR HIGH-PRESSURE, HIGH-TEMPERATURE APPLICATIONS**

. . . . . G. A. Gallagher, T. D. Eubank, A. L. Moran 827

Cover photo: Courtesy of The McNeil Machine & Engineering Co.

The opinions expressed by our contributors do not necessarily reflect those of our editors

## FEATURE DEPARTMENTS

| | | | |
|---|---|---|---|
| News of the Rubber World | 753 | Washington Report | 851 |
| News from Abroad | 754 | Industry News | 859 |
| New Equipment | 766 | News Briefs | 866 |
| New Materials | 770 | News About People | 872 |
| Book Reviews | 782 | Market Reviews | 876 |
| New Publications | 782 | Synthetic Rubber Prices | 878 |
| Meetings and Reports | 833 | Compounding Ingredients Prices | 879 |
| Calendar of Coming Events | 850 | Advertisers Index | 891 |

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Stereo specific polymers to augment or partially replace the natural product will add a third supplier, according to a report by Goodrich-Gulf Chemicals. G-G will build a 25,000-ton-per-year plant for the production of Ameripol SN (cis-polyisoprene) and Ameripol CB (cis-polybutadiene). While site has not been firmly decided at this writing, production is expected by late 1961. This would follow present announced construction of plants by Shell Chemical for its Isoprene Rubber and Phillips Chemical for Cis-4 (cis-polybutadiene).

Considerable stress on new methods of production and machines would appear to be a major feature of the coming decade. As a preliminary indication of some of the things to come, the Akron Rubber Group held a symposium on "Materials Handling." Content of the prepared papers and the tone of many of the questions asked leave little doubt that more efficient handling, process methods, and improved or redesigned machines will contribute to updating the rubber industry in the coming years.

Also indicative of the rapid changes in the industry were some of the steps taken by the advisory committee of Committee D-11 of the American Society for Testing Materials during "Committee Week" of the Society in Chicago in February. A program that will consolidate or revise some of the existing subcommittees, where overlapping or complementary work was being done, has been started and will be continued as conditions permit. In addition, work has been scheduled in some of the newer areas of materials testing, with other developments being watched for possible action.

The special committee formed by the Rubber Manufacturers Association to investigate the Food Additives Amendment met with the FDA and its Food and Pharmacology departments, February 17. One result of this meeting is the appointment of a five-man technical committee by RMA to work with Pharmacology Department in setting up extraction tests on rubber products. A full report on the FDA position will be released very soon by the RMA committee.

# NEWS from ABROAD

## Russia to Improve Rubber Goods Plants

Russia's rapidly expanding economy is imposing ever greater demands on the mechanical rubber goods industry. Output has been increasing and in 1957 was double that of 1950. While quality has also been improved, methods and machinery in several lines are obsolete, requiring much manual labor. Belting continues to be vulcanized in sections in out-of-date hydraulic presses, and neither quality nor range of products is adequate; hose is still mandrel-wrapped; range and volume of goods from synthetic rubber and latices are very limited, and many articles are manufactured from rubber cements with obsolete dipping equipment.

In his article on "Improving Manufacturing Processes at New and Reconstructed Mechanical Rubber Goods Works,"[1] I. M. Pumpyanski gives details of new developments envisaged under the seven-year plan. Besides the erection of seven new factories, 14 existing establishments are to be enlarged and modernized; every operation is to be overhauled, and a high degree of automation is aimed at all along the line, starting with the preparation of stocks. Thus carbon black and most accelerators are to be supplied in pellet form; carbon black and softeners are to be stored loose, for automatic feeding to intermediate containers and scales in the production line.

Two methods have been worked out for automatic weighing and loading of ingredients into mixers: (a) centralized weighing of chemicals and raw materials which are then automatically supplied on conveyors according to a programmed system; (b) equipping each mixer with a system of hoppers and scales and feeding automatically direct to mixers.

Most rubber stocks will be prepared in internal mixers, under increased pressure, with rotor speeds of 30 and 40 rev/min. Rubber works, in collaboration with machinery research institutes, are working on design and construction of modern calenders, and a rapid Z-model, incorporating recent English and Czech data, is expected to be ready this year. A four-bowl universal calender with rolls 1,200 millimeters long is also to be designed in 1960.

Russian scientific institutes for rubber and chemical industries are working on the improvement of equipment and methods for manufacturing belting, hose, tubing, latex goods, and cellular rubber. Flow lines and continuous vulcanization are planned, and some progress has already been made in this direction.

The quality of belting is to be improved by extensive use of synthetic fibers; vulcanizing presses 10.3 meters long, 1.8 and 2.3 meters wide, are to be ordered from East Germany, and equipment for continuous vulcanization of conveyor and driving belts is to be designed and built in collaboration with Czechoslovakia. A unit for making steel cable-reinforced belting 2200-2400 millimeters wide is also planned, and non-flammable PVC conveyor belts are to be made in Russia for the first time.

Injection molding equipment for continuous production of large articles is being designed and will be the main unit in a completely automated flow-line; models are being prepared of large presses, for pressure of 60 kg/cm$^2$, vulcanizing temperature up to 250° C., with individual hydraulic drive and platens cooled under pressure.

Methods have been developed for making braided pressure hose up to 38-millimeter diameter without mandrels, and of fabric-reinforced hose, up to 102 millimeters in diameter and 100 meters long. Production is to begin of braided hose for drilling and boring, and benzene-resisting hose up to 76 millimeters in diameter and 18-20 meters long; a flow-line has been set up for producing braided hose up to 4.5 meters long for agricultural and special purposes, and lengths up to 10 meters will be made at newly planned works.

Electrodeposition of natural rubber and synthetic latices is to be perfected; surgical and non-conducting gloves, for up to 6,000 volts, are to be made from natural rubber latex instead of rubber solutions. A method has already been worked out for continuous manufacture of foam rubber from natural and butadiene-styrene (50/50) latices, involving mechanized mixing, the use of a highly efficient blowing agent, and vulcanization in high-frequency current in continuous apparatus.

[1] *Soviet Rubber Tech.*, Nov., 1959, p. 11.

## Malaya Future Bright

The year 1959 was the best the Malayan rubber industry has had in many a year. Production was the highest in nine years; exports of crude and latex reached all-time highs; and price was the best since 1955.

### New Records Set

Total Malayan production came to 698,248 tons (Federation 695,976 tons, and Singapore 2,272 tons), showing an increase of 5% over 1958 output. The record exports of 1,201,114 tons were more than 11% above those for 1958 and even 4% over the previous record reached in 1951. The United States was Malaya's best customer last year, with Russia next. With the exception of Britain and China, all of Malaya's ten best customers increased their purchases. The table below shows the amounts they took and the percentage increase or decrease against 1958:

| | Tons | % |
|---|---|---|
| United States | 169,681 | +25.2 |
| Russia | 165,730 | +146.0 |
| United Kingdom | 158,975 | −7.0 |
| Japan | 120,788 | +10.0 |
| Western Germany | 89,836 | +12.5 |
| France | 63,901 | +22.6 |
| Italy | 50,367 | +0.05 |
| China | 49,532 | −22.6 |
| Canada | 34,202 | +31.9 |
| Australia | 33,042 | +8.0 |

It may be added that Argentina cut her share by about 4,000 tons to a total of 22,238 tons in 1959; while, on the other hand, Brazil's total of 18,373 represented an increase of almost 10,000 tons.

Increased interest in natural rubber latex by the chief consuming countries raised the 1959 exports by 12% to 128,650 tons. Britain, the best customer, took 32,854 tons, or 7% more; the United States was a close second, with purchases up 14% to 32,256 tons; West Germany's share at 14,558 tons was 32% higher. The shipments to Japan showed the spectacular jump of 65% to reach 16,477 tons.

Imports of natural rubber totaled 473,763 tons, 15½% more than in 1958 and the highest since 1951. The increase is largely ascribed to the rush by Indonesian exporters during the last quarter of 1959 to gain what advantages they could before the new export licensing regulations issued by the Indonesian Government for the first of this year, went into effect. It is assumed that the new regulations will slow down shipments from Indonesia to Malaya.

The average noon f.o.b. price of rubber in Singapore last year was 101.35 cents a pound, as compared with a little over 80 cents in 1958; the highest closing price in 1959 was $1.36¼ on November 17, (33⅞ cents over the highest for 1958) and the lowest 83⅞

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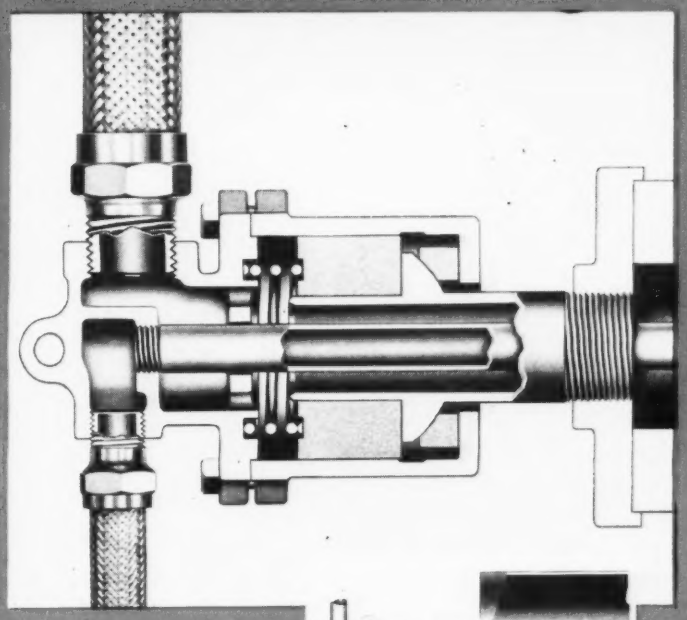

***For water cooled or steam heated rolls...***

For the job of getting water or steam—or both, intermittently—into mills and calenders, Johnson Joints out-number and out-perform anything of their kind. All of those you see here seal without packing, need no lubrication or adjustment, and are completely self-supporting. They take today's high speeds, pressures and temperatures right in stride—can be furnished for use with Dowtherm, Monsanto Aroclors and hot heat transfer oils up to 700°F., pressures to 250 psi. and higher.

**TYPE SB JOHNSON JOINT**

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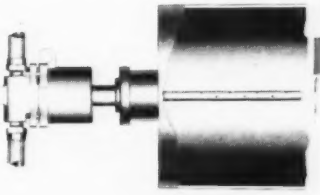
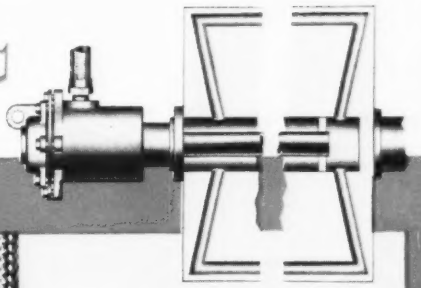
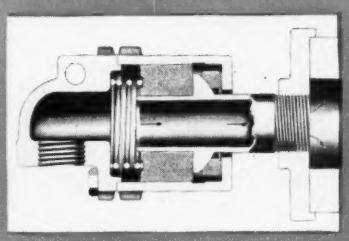


**TYPE SN JOHNSON JOINT**

Used for rotating internal pipe applications. See typical installation on drilled roll. Assembly plate between head and body of joint facilitates mounting and inspection. The seal between rotating and stationary surfaces is still accomplished without any packing.





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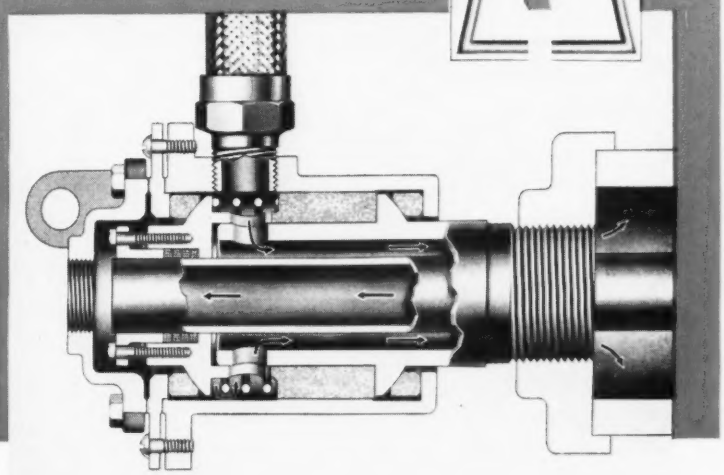

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cents on February 2 (12½ cents above the lowest for the preceding year.)

Stocks in Malaya rose 11% to 109,616 tons at the end of the year.

### 1960 Prospects Good

With the start of a new year, prospects of the Malayan rubber industry have naturally been a chief subject for discussion, and the consensus seems to be that they are good. The announcement of Russian sales from stock affected the market at first, but later confirmatory reports caused no stir. Neither has the probability, freely faced, that Russia and China will not be buying rubber during the first quarter of 1960, cast any significant damper on the feeling that the rubber industry will continue to prosper this year too.

To be sure, H. H. Facer, chairman of Tanjong Malim Rubber Co., Ltd., warned at the company's annual meeting held in London that a long continued situation where the price of natural rubber was much in excess of that for synthetic would certainly have dire results for the natural rubber industry. However, he too saw bright prospects for the future.

Referring to the success of the Alliance Party in the recent Malayan elections, (which left no doubt as to its appeal to the electorate of the country) he said that this government with its liberal policies and intentions to attract and protect foreign capital, gives confidence to outside investors, including that large group, the owners of rubber estates. Further favorable notes are that Communist terrorism is now virtually over; conditions on estates are easier; and labor more contented and in better supply.

Sir John Hay, chairman of Guthrie & Co., Ltd., who recently visited Malaya, seems to have no doubts about the future of natural rubber, at least up to 1965. He finds that the present situation, where the price of natural rubber continues well above that of synthetic, while there is a shortage of the former and excess of the latter, clearly indicates that natural rubber has special qualities which synthetic is not yet able to replace. He foresees that between now and 1965, world supplies of natural rubber will increase by 250,000 tons, but demand for all rubbers will rise by about 1,000,000 tons a year. Any gap will be bridged by increased use of synthetic rubber and continued releases of government stocks of natural rubber, whereby the latter will be depleted, which drain again will strengthen the position of natural rubber. By 1965 Malayan output will amount to 850,000-900,000 tons, and she will be the world's biggest producer of natural rubber. It is to be noted that Sir John hesitates to claim that title for Malaya now, because, as he reportedly said, it is hard to find out what Indonesia's actual present output is.

### Views on Research

Referring to natural rubber research, Sir John bluntly stated that the first essential is to have a program of research and then to find the money for it and not the other way around; he believes also that in the past much money for research has been spent unwisely. He agrees with Sir Geoffrey Clay, Malaya's Rubber Controller, that the rubber road program in the United States should be curtailed; as to the natural rubber technical advisory service, he feels that there is little it could tell the big manufacturer. What he favors, apparently, is a line of research to prolong the life of the rubber tree. With the present economic life of 33 years for a rubber tree, the tapping time is about 26 years; if this period can be prolonged, he adds, replanting costs will be reduced, and more rubber cheaply obtained.

The economic life of budded rubber trees in Malaya is now 41½ years, and of seedlings, 43 years, a spokesman for the Rubber Research Institute reportedly said in commenting on the above statements by Sir John. This, it seems, is recommended by the Institute as a reasonable tapping life for trees; it permits an estate of 100 acres, for instance, to be replanted at the rate of 2½ acres a year, and replanting to be completed in 40 years, with the full number of trees maintained throughout. However, proper planting and care of the trees are essential.

## Compatibility of SBR Extender Oils

In the production of oil-extended rubbers the aim is to incorporate the maximum proportion of oil and still maintain mechanical properties unimpaired. The molecular interaction of oil and rubber, their chemical composition, and its effect on mutual compatibility are the important factors here. To discover the most suitable oils, I. Ya. Poddubny and E. G. Ehrenburg,[1] studied the thermodynamic parameter $\mu$ in its relation to the chemical composition of the components. They worked out an equation by which all values for $\mu$ could be calculated for all the systems studied, including various oils and butadiene, butadiene-styrene, butadiene acrylonitrile and chloroprene rubbers. Data obtained seemed to indicate that the value of $\mu$ decreases with increased aromatic hydrocarbon content in the oil, and it was found that the oils most compatible with the raw rubbers were those with high aromatic carbon content and relatively few paraffins in the paraffin-naphthene fraction.

The chemical nature of the polymer is also important; polar rubbers (nitrile and chloroprene) show poor compatibility; while compatibility of butadiene/styrene rubbers decreases with increasing styrene content.

Oil PN6, containing 91% aromatic hydrocarbons, showed highest compatibility with all the rubbers studied, but especially with butadiene/styrene rubber. Avtol-18, the oil presently used in oil-extended butadiene-styrene rubber, occupies an intermediate position as to compatibility.

[1] *Soviet Rubber Technology*, Nov., 1959, p. 14.

## Pelletized News

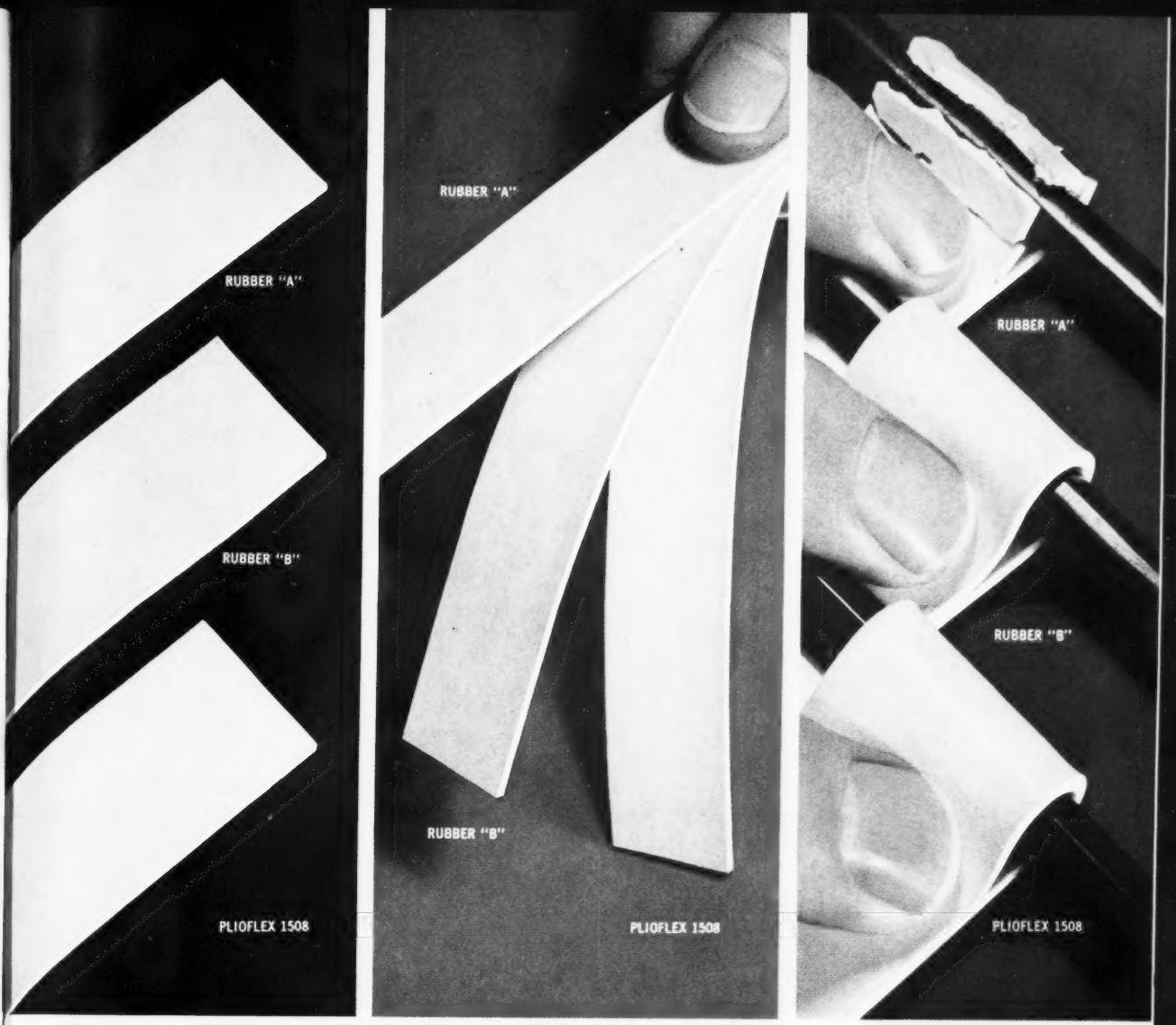
**Rubber exports from Thailand were up in 1959:** 82,705 tons were shipped during the first half of this year, compared to 71,728 tons in the corresponding period in 1958.

**Shipments of rubber from Malaya during the first nine months of 1959,** at 888,136 tons, broke the previous record of 887,502 tons, exported in the same period of 1951. The 1959 exports were almost 4% above those for the corresponding period of 1958: while the average price for rubber at 96.57 Straits cents was 24% higher than during last year. Rubber imports for the nine months came to 336,248 tons, up 11.7%.

**Foam rubber production in Japan has developed rapidly.** From the first reported output of 40 metric tons in 1950, the total rose to 5,914 tons in 1958, and the estimate for 1959 is 9,000 tons. Most of this material is made by the Bridgestone Tire Co., Tokyo. This company reportedly intends to increase its present monthly output of 400 tons to 800 tons and to this end is building a new foam rubber factory at Yokohama, which is to be equipped with modern machinery, including various automatic devices.

**The use of fiber glass in natural and synthetic rubbers, silicones, and Vulcollans as well as in certain thermoplastics** is discussed by Kurt A. F. Schmidt in two articles in *Kautschuk und Gummi*.[1] In the first article, specific applications are dealt with—as reinforcement in belting, brake linings, hose, tires, thread, foams, moldings, and coated fabrics. The German and foreign patents and literature on methods of reinforcement are reviewed in the second paper, especially the preparation of the fiber to insure adequate bonding with rubbers and other elastomers, by preliminary impregnation with various adhesion-promoting dispersions and solutions.

[1] Oct., 1959, pp. 268 and 298 WT, respectively.

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# GOODYEAR

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Chemigum – T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

# GOODYEAR

CHEMICAL DIVISION

*Both tires shown here have traveled 14,000 miles under identical conditions. Sidewall on right was made with PLIOFLEX "C" type rubber stabilized with new WING-STAY 100.*

# Now—rubber that keeps its age a secret

**Whirling around** a test track—or spinning through traffic—tires *age* with wear. The effects of this aging process show up most often in the sidewalls, where small cracks appear. Not only do they mar the looks of the tire, they rob it of strength and cut into its service life.

**What causes cracking?** Two things, mainly—atmospheric oxygen and ozone. To combat them, antioxidants have been developed. So have antiozonants. *But not until now* has a truly effective *combination* of antioxidant and antiozonant been perfected. And that's WING-STAY 100 by Goodyear.

**The superior protection of Wing-Stay 100** can be yours in four new PLIOFLEX rubbers. Dynamic aging resistance thus becomes another key advantage of PLIOFLEX 1500C, 1710C, 1712C, and 1714C – along with assured processability, high uniformity and excellent physical characteristics.

**For more information** and complete technical service on PLIOFLEX "C" type rubbers—plus other rubber chemicals and a full line of synthetic rubbers—write:

Goodyear, Chemical Division, Dept. O-9418,
Akron 16, Ohio

GOODYEAR

CHEMICAL DIVISION

Wing-Stay, Plioflex = T.M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

PROFITS GROW WITH COLOR
WHEN YOU USE HI-SIL®,
CALCENE® AND SILENE®

Open a world of color—and new profit—with Columbia-Southern high-quality white reinforcing pigments—Hi-Sil, Calcene and Silene.

The sales word for your product is *color*. Retailers love it—customers *buy* it. Brilliant brights. Subtle pastels. Deep tones of rich hue. Columbia-Southern's reinforcing pigments open the color kaleidoscope—and the sales door.

These pigments let you add the profit touch of color. They impart excellent physicals to help products withstand extreme punishment—your products last longer and sell better.

We'd like to offer specific formulation assistance to explore *your* product's color potential and to upgrade specific properties. Address us at Pittsburgh or any of our District Sales Offices. *You'll like doing business with Columbia-Southern.*

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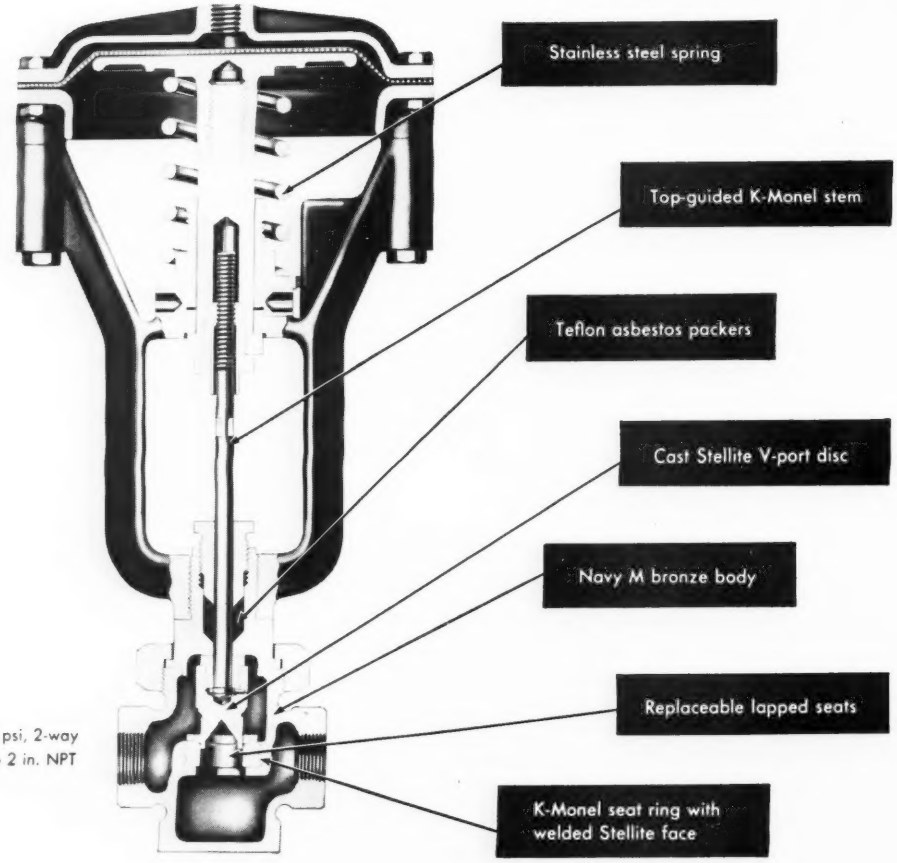
COLUMBIA-SOUTHERN CHEMICAL CORPORATION
A Subsidiary of Pittsburgh Plate Glass

# SINCLAIR-COLLINS® V-PORT VALVES




**. . . for precise control of pressure or temperature . . . steam, hot or cold raw water service**

Sinclair-Collins' V-port valves offer a solution to your temperature or pressure modulation problems. Designed for instrument actuation, they offer variable metering to provide extremely accurate and consistent control of media flow rates. Highest quality materials and Sinclair-Collins' precision manufacturing methods assure long, reliable service life, with minimum maintenance downtime. Stainless steel trim resists corrosion . . . Stellited seat ring and port disc resists wire drawing and cutting. Find out how S-C V-port valves can meet your control needs . . . a call to your near-by Sinclair-Collins Field engineer will bring prompt application engineering recommendations.

*For more information write for free Bulletin SC-59. Address: Sinclair-Collins Valve Company, Akron 9, Ohio, Dept. RW-360*

**The SINCLAIR-COLLINS VALVE Co.**

AKRON, OHIO

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

*Other INDUSTRIAL DIVISIONS of IBEC: The Bellows Co., Akron, Ohio • Valvair, Akron, Ohio • V. D. Anderson Co., Cleveland, Ohio*

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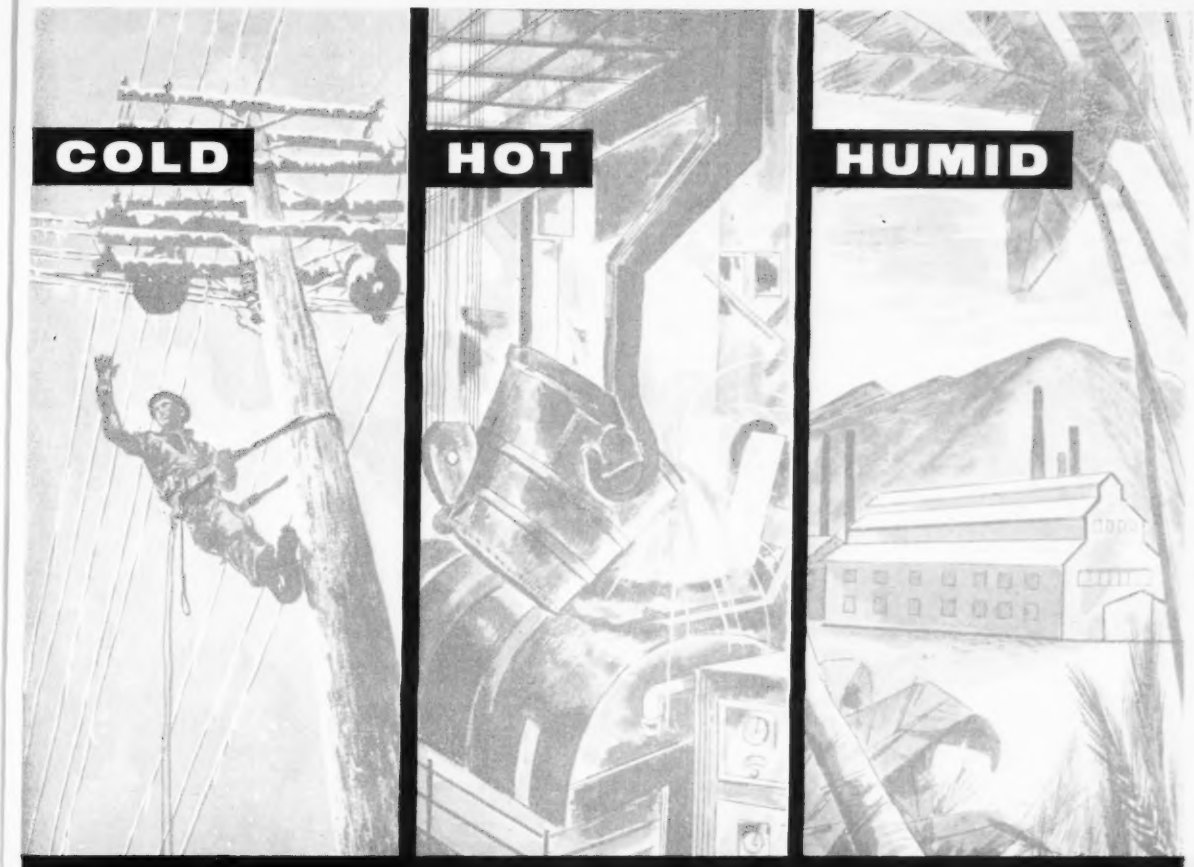



for electrical insulation that must take it...

# MARBON 8000® AE

## REINFORCING HIGH-STYRENE RESIN

In frigid northern climate or in the humid tropics . . . for use with hot industrial machinery or with telephone wires . . . electrical insulation compounds, modified with Marbon 8000 AE resin give superior performance.

This hydrocarbon resin also offers proven production advantages: fast, smooth extrusion at lower mixing temperatures, with less scorch . . . good resistance to heat aging . . . high tear and cut resistance . . . low moisture pick up . . . maximum electrical properties and flexibility of compounding with reduced overall cost.

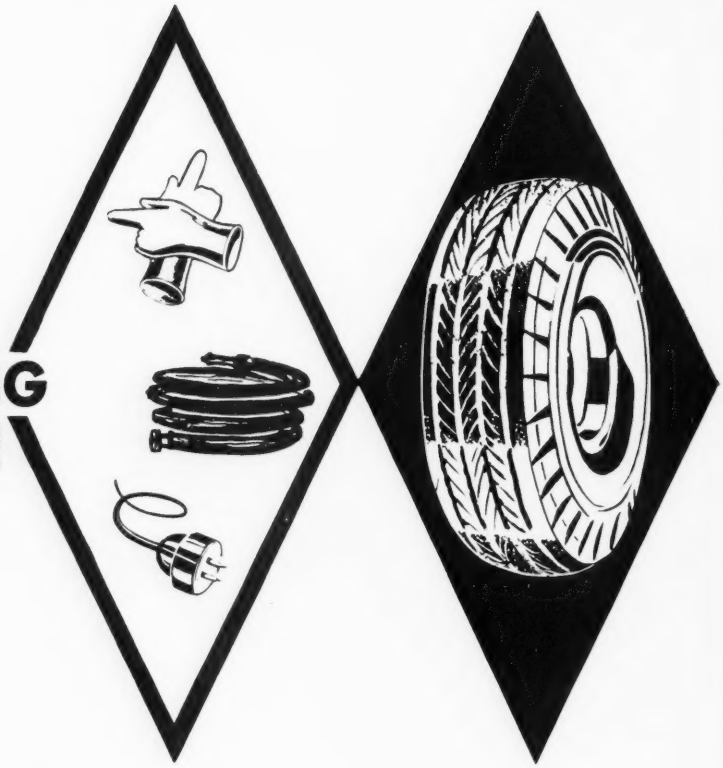
For your next SBR wire insulation compound that must really take it, specify Marbon 8000 AE resin.

*Write Today for Complete Information*

**MARBON CHEMICAL** WASHINGTON — DIVISION **BORG-WARNER** WEST VIRGINIA

For

# MAXIMUM SUN-CHECKING PROTECTION



## Specify Original Formula

# "Antisun"

by

# CARY

**Maximum protection against sun-checking over extended periods can only be guaranteed when a top-notch sun-checking agent is employed.**

## *Cary "Antisun,"*

formulated of the finest quality ingredients and proven so satisfactory in tire compounding, mechanical goods, insulated wire and cable compounds, is still the same basic formula developed by Cary years ago.

- Recommended usage: 2-4% of the weight of the rubber hydrocarbon, depending on the degree of protection desired.
- Unlimited Availability.
- Low Cost.
- Available in convenient chipped or slabbed forms.

CARY CHEMICALS INC.

## CARY CHEMICALS INC.

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**Plants at: East Brunswick and Flemington, N. J.**

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***MUEHLSTEIN'S*** **technical staff is always available to assist our customers in developing economical compounds of proven quality.**

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- CRUDE RUBBER
- SYNTHETIC RUBBER
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- MASTERBATCH
- GROUND STOCKS
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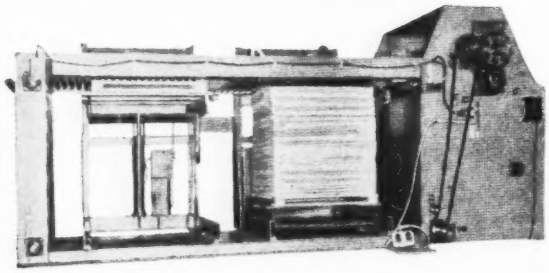
INCREASE PRODUCTION . . . DECREASE COSTS

WITH

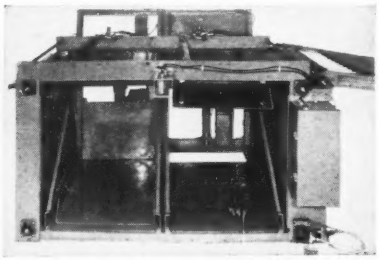
**NEW HIGH SPEED**

*Automatic*

**Cutting and Stacking Units**

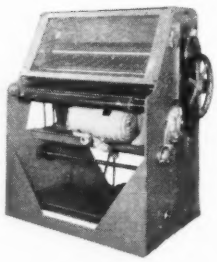


These highly efficient machines are furnished separately or as a complete self-contained unit for automatic cutting and stacking of materials from extruders, mills, calenders, and other processing lines. The Alfa Rotary Cutter is complete with a variable drive for automatic synchronization to the material speed, and length of cut can be easily and infinitely adjusted within the given range. Alfa Stackers are available with single or double stacking units. They accommodate a wide variety of materials and stack on lowering skids that are easily handled by fork truck.



CUTTING and STACKING FEATURES . . .

- Blades easily adjusted to micrometer exactness
- Cuts and stacks at speeds up to and exceeding 100/ft. min.
- Handles material widths from 24" to 50"
- Cuts lengths from 24" to 60"
- Stack per skid 40" high, max. skid load 4000#



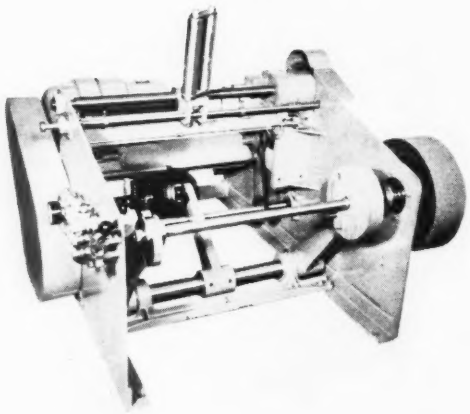
SPADONE MACHINE CO. INC.

SOUTH NORWALK, CONN. PHONE: VOlunteer 6-3394

ILLINOIS OFFICE: P.O. BOX 328, LAGRANGE PHONE: FLeetwood 4-4811

**Representative for Alfa Machine Co.**

# NEW EQUIPMENT



Davis-Standard Model SR 36 Take-Up

## New D-S Model SR 36 Take-Up

A new 36-inch single-reel take-up for wire insulating lines is being marketed by Davis-Standard, division of Franklin Research Corp., Mystic, Conn. The new unit, Model SR 36, is designed for wire speeds up to and exceeding 2,000 feet per minute. It handles reels from 12 to 36 inches in diameter, up to 24 inches wide. Full reels up to 2,000 pounds can be accommodated.

The 36-inch take-up has pneumatic reel arms, adjustable dog pin and infinitely adjustable traverse lay and movement. The ball-bearing-mounted wire-guide rolls accept wires ranging from "O" gage to ¾-inch. All rotating parts are mounted in sealed, double-row ball bearings.

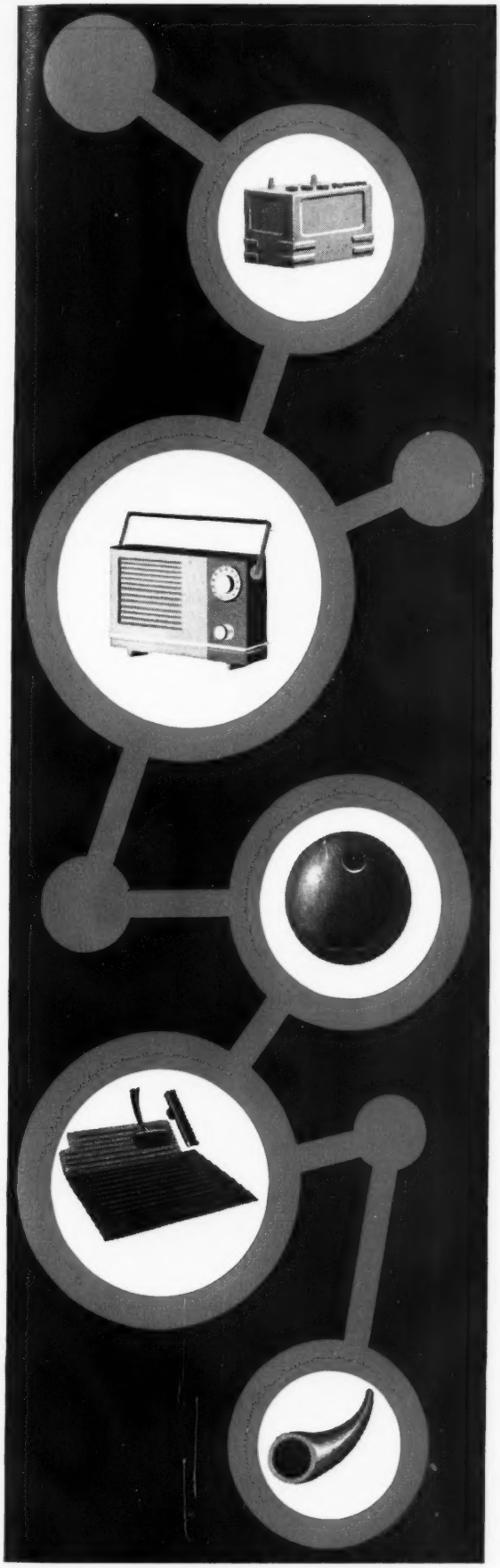
Available with a variety of drives, Model SR 36 is a fast, compact take-up for general wire insulating operations. Complete specifications are available in Davis-Standard Catalog Section 8.7 which can be obtained from the company.

## New Dot Welder Die Repairer

A new, fast, and inexpensive method of repairing scratches, errors and undercuts in injection molding dies recently was developed by the Mid-States Welder Mfg. Co., Chicago, Ill. The new process, field tested for some five years, is said to be a realistic answer to the bothersome, time consuming problem that has hampered the injection molding industry for years.

The new process, called "Dot Welding," is described by the manufacturer as a fusion of metal pellets by a gun-type welding device into the damaged die. The die need not even be removed from the machine to make the repair. The fusion is produced by a short impulse of high-density electrical current in the welder. This current raises the temperature to the point of fusion and allows the pellet to flow into the cavity or scratch, and the heat does not harm the metal die.

In a few minutes, it is claimed, the die may be filed or finish ground and polished to a point where it is almost impossible to detect the original imperfection. Because the electrical impulse is so short in duration, the die need not be preheated. The new Dot Welders and Pellets are now available from the company at a very nominal cost.



# ONE VERSATILE FR-S POLYMER MAKES GOOD IN MORE THAN 500 APPLICATIONS

Firestone's FR-S 1006 is a light-color, non-staining, easy-processing synthetic with a high pigment extension capacity. It weds well with other rubbers or with resins and requires a minimum of expensive pigments.

Firestone offers you the largest, most complete line of polymers available, plus specially trained Technicians to help you produce and market your products without obligation. Just write Firestone Technical Service, Dept. 21-2, Firestone Synthetic Rubber & Latex Co., Akron 1, Ohio.

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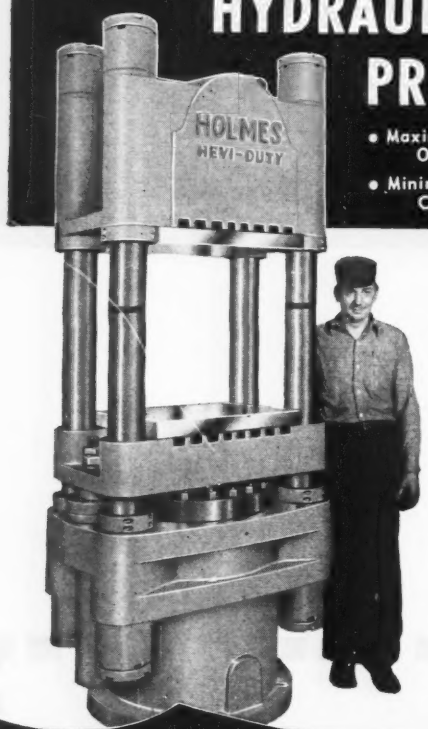
SYNTHETIC RUBBER & LATEX CO.
AKRON 1, OHIO

FR-S

MAKING THE BEST TODAY STILL BETTER TOMORROW

Now... PRECISION MOLDING
is NO PROBLEM
with the new and improved
HOLMES
HYDRAULIC
PRESS

- Maximum Output
- Minimum Cost




New Features--Precision Results

The new and improved Holmes Hydraulic Press retains all the features of its famous predecessors... PLUS...many outstanding improvements. These put it in a class by itself--for all kinds of general purpose work...and...special production where close tolerance is required. Low in price. Practically no maintenance. Will quickly pay for itself in any processing plant.

WRITE OR WIRE FOR SPECIFIC DETAILS--regardless of your particular requirements. With 52 years know-how specializing in machinery and molds for the rubber industry--Holmes can help you solve your problems, too, just as they have for so many others. No obligation, of course.

SEND FOR ILLUSTRATED FOLDER...TODAY

Stanley H. HOLMES Company
Successor to Holmes Brothers, Inc.
3300 W. Lake Street, Chicago 24, Illinois

# New Equipment

Pyro-Werk pyrometer

## Surface Contact Pyrometer

EPIC, Inc., New York, N. Y., has been appointed the sole United States distributor for the surface contact pyrometer manufactured by Pyro-Werk, A.G., Hannover, West Germany. The pyrometer is a self-contained, practical instrument for quick and accurate measuring of surface temperatures. The instrument is handy, sturdy, and compact and has an automatic cold end compensation.

The instrument consists of a hand-held temperature indicator and a surface tracer equipped with a thermocouple head. A wide variety of heads is available in the form of a disk, band, ribbon, or needle. All surface tracers are interchangeable and can be either rigidly or flexibly attached to the indicator. The various standard measuring ranges are available up to 1800° F.

The instrument is said to be ideal for measuring temperatures on all-metal surfaces including slowly revolving cylinders or other curved surfaces, for example, calenders in the rubber industry. Surface tracers are available for measuring ingots, dies, molds, press platens, and substances such as rubber or plastic samples.

The pyrometer is supplied in a wooden carrving case which holds the indicator and up to four surface tracers.

A brochure giving a more detailed description of the pyrometer is available from EPIC, Inc.

## Consol-Matic Wet Blast Unit

A new wet blast unit, capable of being operated by a person in a sitting-down position, has been announced by Pressure Blast Mfg. Co. Inc., Manchester, Conn. The Consol-Matic, as the unit has been designated, was specially designed for the high production rate finishing of small parts.

Two bays are provided at the operating station where work is loaded and unloaded. Moving blast guns, driven by air cylinders, are positioned at each bay. In operation, the operator places parts in either or both bays and depresses the foot lever. This action begins movement and activation of the blast guns. A preset timer determines the length of blast time as well as the speed of gun oscillation.

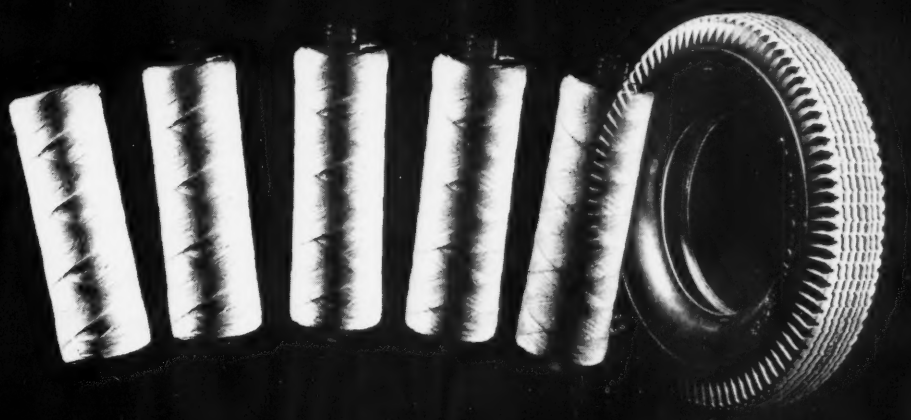
Positioning devices are provided for the blast finishing of parts which require them. Guns are individually movable, adding to the flexibility of the unit.

The Consol-Matic operates on the plant compressed-air system which eliminates the need of a pumping mechanism in the blast circuit. Employing fine abrasives (up to 5,000 mesh), the unit imparts fine, satin, chemically clean surfaces without heavy etching, stock removal, or distortion, it is said.

Dimensions of the Consol-Matic are 46 inches high, 24 inches wide, and 34 inches deep. Construction is of 14-gage stainless steel. Weight is only 130 pounds, which allows installation on upper floors where stress is a factor.

EXPERT ASSISTANCE

ON NYLON TIRE CORD PROCESSING



Since the original conception of the use of nylon for the construction of superior tires, C. A. Litzler Co. engineers have led the way in building advanced tire cord processing machinery to successfully handle this more difficult material.

Litzler engineers developed and installed the first nylon cord unit ever built, exerting 8,000 pounds in tension, in 1949 . . . . in 1951, the first 12,000 pound nylon dip unit . . . . in 1952, the first all-nylon calendar train . . . . in 1954, the first dual zone nylon unit (20,000 pounds) . . . . in 1957, the first triple-zone nylon calendar line (30,000 pounds) . . . . and, in 1959, the first medium-scale simplified nylon unit for universal application.

Leadership in nylon processing requires a thorough understanding of high tension and high temperature handling; practical application of multi-step treatments in zonal processing; sensitive and sure control of exposure times, impinging 2-side air velocities, and many other vital factors. For positive answers to any question of nylon fabric impregnation and processing, consult

C. A. LITZLER CO., INC.

*SOUND ENGINEERING FOR TOMORROW'S PRODUCTION*

**235 BROOKPARK RD. CLEVELAND 9, OHIO CABLE "CALITZ"**

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**LICENSED FABRICATORS:** Benno Schilde Maschinenbau A. G. Bad Hersfeld, Germany — Soc. Alsacienne de Constructions Mecaniques Paris, France — Mather & Platt, Ltd. Manchester, England

*Vulcanized*
**vegetable oils rubber substitutes**

Types, grades and blends for every purpose, wherever Vulcanized Vegetable Oils can be used in production of Rubber Goods — be they Synthetic, Natural, or Reclaimed.

***A long established and proven product.***

**THE CARTER BELL MFG. CO.**
SPRINGFIELD, NEW JERSEY

Represented by
HARWICK STANDARD CHEMICAL CO.
Akron, Boston, Chicago, Los Angeles, Trenton, Albertville, (Ala.), Denver, Greenville, (S. C.)


# NEW MATERIALS

## "Seamag" MgO for Neoprene Rubbers

A new magnesium oxide for neoprene rubber, designated "Seamag," is now in commercial production at Food Machinery & Chemical Corp.'s mineral products division's magnesias-from-seawater plant at Newark, Calif. Commercial availability of "Seamag" follows research and process development work by FMC at the Newark plant and testing by a leading independent rubber laboratory and commercial users of neoprene-grade magnesias.

"Seamag" is described as being odorless, non-toxic, free-flowing, hygroscopic, and an extremely fine powder. Loose bulk density is approximately 18 pounds per cubic foot. Screen size is 1% maximum remaining on a 325 mesh screen.

Primary use of "Seamag" is as a vulcanizing agent. In neoprene polymers, "Seamag" is said to reduce scorch at processing temperatures. It acts as an acid acceptor during and after vulcanization, is a milder peptizer, and improves bin aging of stocks. It also serves as a filler.

Samples and data sheets on this new product are available from the chemical division, FMC, New York 17, N. Y.

## Cohrlastic 975 "Viton" Sheet

Cohrlastic 975 "Viton" Sheet, a new rubber sheet stock, is now available from the Connecticut Hard Rubber Co., New Haven, Conn. Having increased resistance to strong fluids at extreme high temperatures and good service life, this material can now be specified for commercial applications such as aircraft and missile parts, automotive applications, oil-well equipment, and chemical processing equipment.

The material, a 75-durometer high-quality stock, is said to have excellent resistance to a wide variety of chemicals and fluids including carbon tetrachloride, benzene, and most mineral acids. Resistance to fuels, oils, and lubricants consists of those used in missiles and high-speed aircraft such as JP-4 fuel, MIL-O-5606 oils, MIL-L-7808 diester lubricants, and silicone oil lubricants.

The new sheet material after exposure to extreme high temperature is said to offer significant improvement in performance. Heat aging tests at temperatures in the 500-600° F. range show a better elongation retention and less hardness change than previously possible with any commercial elastomer, reports the manufacturer.

Cohrlastic 975 "Viton" Sheet is available from stock in 12 by 12 inches and 24 by 24 inches in molded sheets in 1/32-inch, 1/16-inch, 3/32-inch, and 1/8-inch thicknesses. Made to order material is available in thicknesses over 1/8-inch.

Additional information is available from the company.

## New Vultafoam Urethane Prepolymers

General Latex & Chemical Corp., Cambridge, Mass., has announced the availability of rigid and semi-rigid urethane prepolymers under the trade name Vultafoam. Research and development and production facilities have been expanded considerably at the Cambridge plant to produce substantial quantities of prepolymer for various end-use applications.

Vultafoam can be used in various industrial applications

*(Continued on page 794)*

## *Roebling Tire Bead Wire: Packaged for Maximum Benefit*

The problems eliminated by this unique reel-less core packaging system are manifold. Loads are palletized two cores per pallet and may be stacked two or three high. This, plus the fact that you need not accumulate empty reels means storage space requirements are cut to *less than half*. You do away with all freight and handling costs on reels, the bother and expense of "bookkeeping" returnable reels, and the freezing of money in reel deposits.

This is typical of Roebling's advanced packaging methods—that makes handling Roebling high-quality wire so much easier. For details on this efficient Roebling Tire Bead Wire packaging method, or information on other types of Roebling wire, write Roebling's, Wire and Cold Rolled Steel Products Division, Trenton 2, New Jersey.

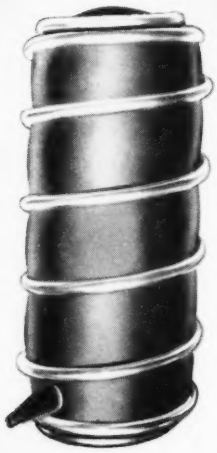
**ROEBLING**

*Branch Offices in Principal Cities*
*John A. Roebling's Sons Division*
*The Colorado Fuel and Iron Corporation*

## WHAT'S NEWS IN RUBBER

**RADIATOR HOSE** of Enjay Butyl holds off deterioration from heat, rust inhibitors, anti-freeze and other chemicals. Keeps its shape and resiliency for years.

**WINDSHIELD STRIPPING** of Enjay Butyl resists ozone, weathering, sunlight, and retains elasticity, color, smoothness far longer than SBR or natural rubber.

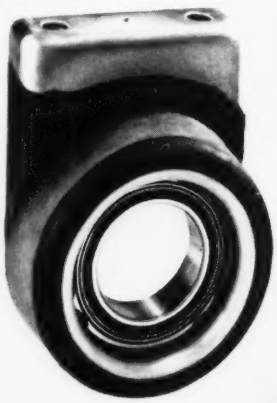


**PNEUMATIC SPRING CONTROL** of Enjay Butyl provides outstanding air retention and aging resistance. Tough and weatherproof, too.

**TIRES** of "No-Screech" Enjay Butyl deliver super traction for fastest, safest stops! Resist off-road abrasion, chipping. Side walls don't crack or "powder off."

**BODY BUMPERS** of Enjay Butyl absorb impact instead of transmitting shock. Butyl "load cushions" for trucks damp out vibration, replace springs.

**DRIVESHAFT HANGER** of Enjay Butyl damps out driveshaft vibration, thus effectively limiting the rotating shaft's resonant response.



# ENJAY BUTYL...PREFERRED RUBBER

Engineers who pick and choose automotive materials prefer Enjay Butyl over natural and other types of rubber for many important applications... and the list is growing. A few examples are shown above.

The all-around resistance of Enjay Butyl to destructive conditions is well proven...it stands up to weathering, sunlight, heat, cold, electric arcing,

***EXCITING NEW PRODUCTS***

**ENJAY COMPANY, INC.,** *15 West 51st Street, New York 19, N. Y.*

# FOR OVER 100 AUTOMOTIVE USES!

flexing, tearing, abrasion, chemicals. And . . . Butyl is outstanding for its air-holding in such pneumatic applications as inner tubes, hose, and pneumatic spring controls.

Why not check into the advantages that versatile Enjay Butyl can give your product? Call or write us today.

***THROUGH PETRO-CHEMISTRY***

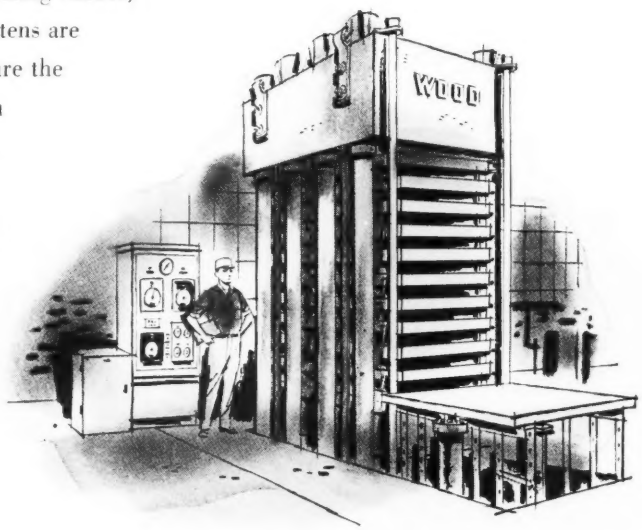
*Akron • Boston • Charlotte • Chicago • Detroit • Los Angeles • New Orleans • Tulsa • Toronto*

ENJAY BUTYL

## *R. D. Wood heating platens...*

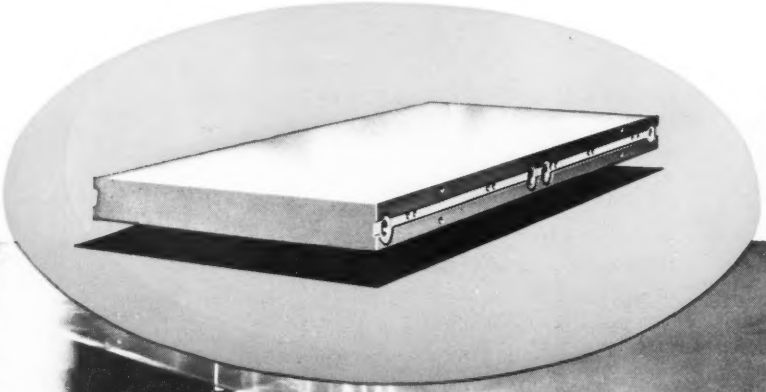
### *precision-engineered to give you superior finished products*

Here's the perfect working surface for processing rubber, plastics and wood products. R. D. Wood platens are carefully designed and manufactured to assure the highest-grade surface finish. With them, you produce top quality products—consistently. They are made from especially processed rolled steel slabs, machined to close parallel tolerances and drilled with extreme accuracy on evenly spaced centers to insure equal heat distribution throughout the platen. Here is precision. Perfect for your new press. Perfect for replacement on existing presses. Perfect for more value, longer life.

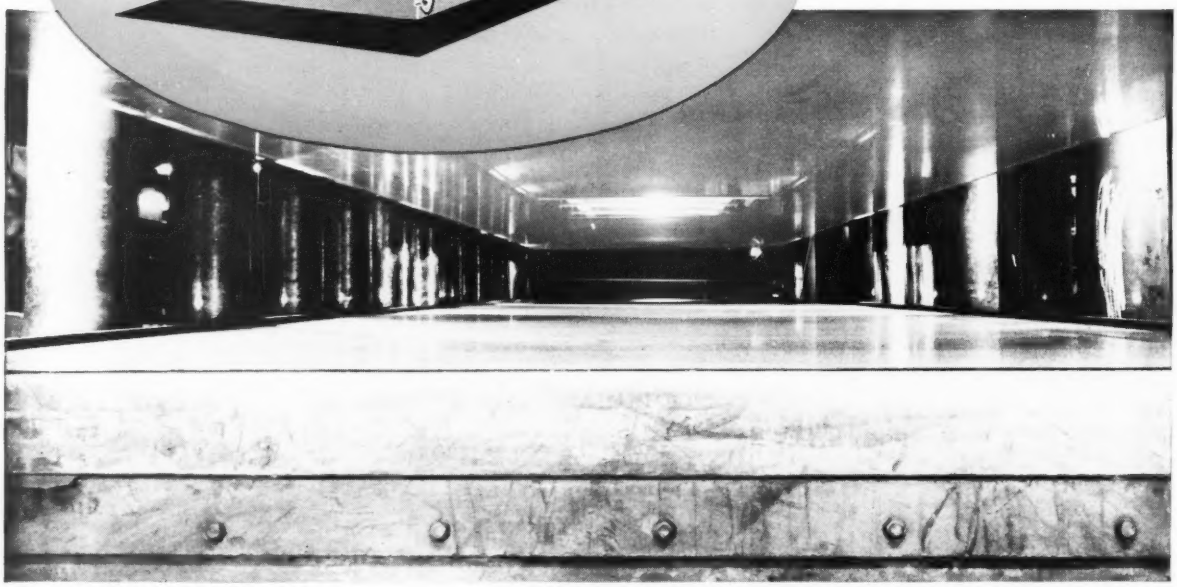



**R. D. WOOD COMPANY**

PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA

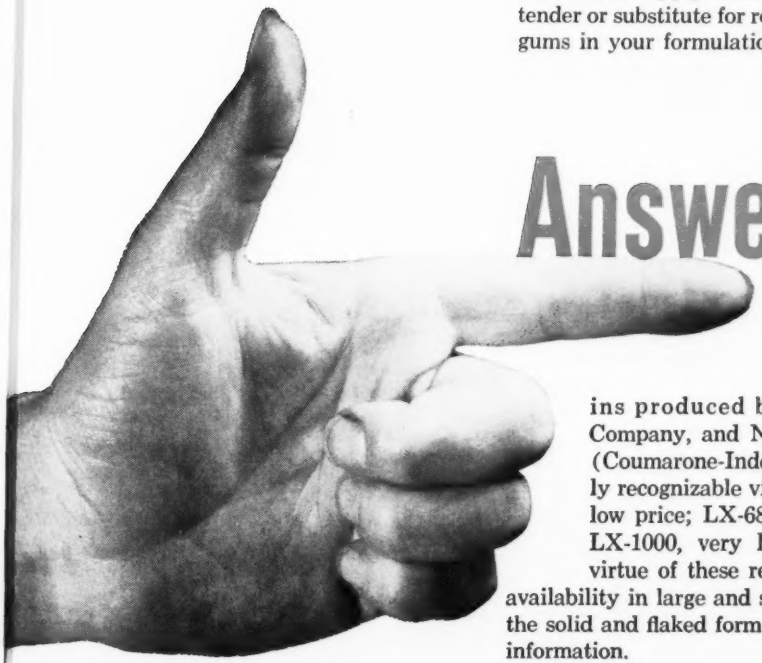


Three types are available: steam heated, electric heated and electric heated with cooling provisions. Whatever your requirements, for a new press or replacement of worn-out platens, write today for full information.



# Question:

Has scarce supply caused you to look for an extender or substitute for rosins, wood rosins or ester gums in your formulations?

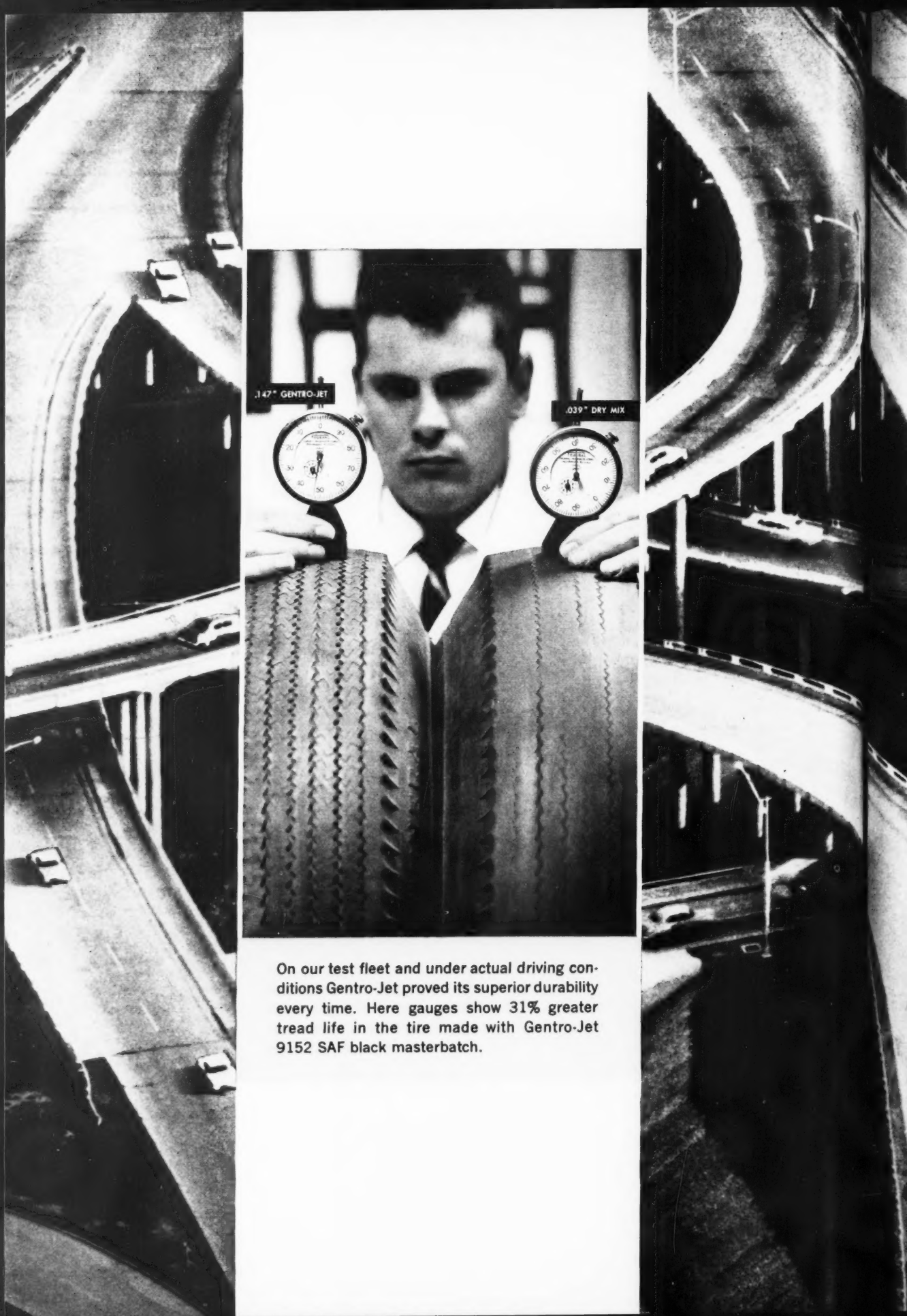


# Answer:

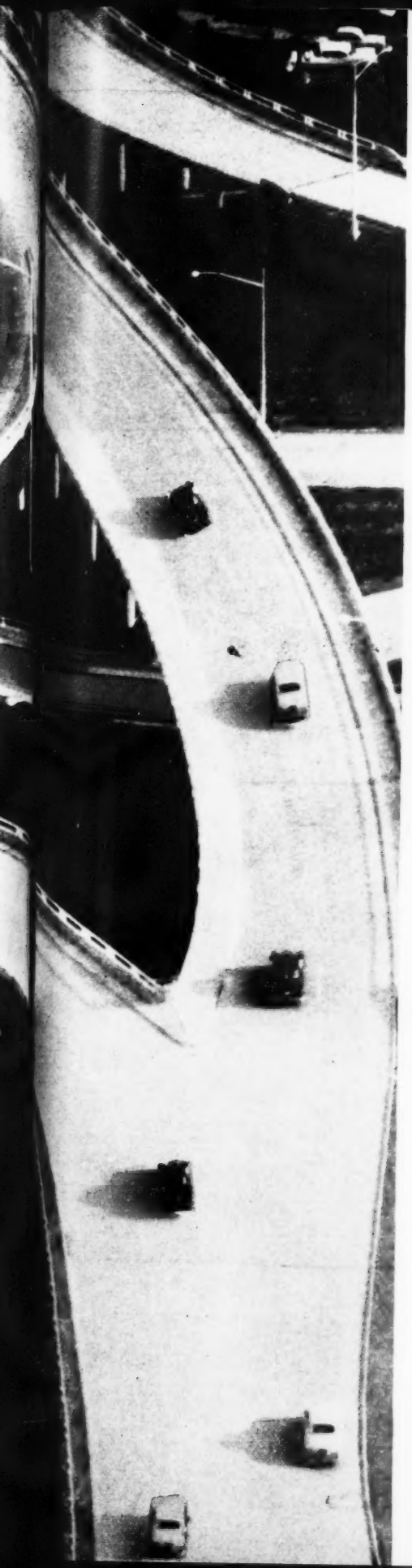
If so, we suggest you experiment with the LX series of hydrocarbon resins produced by Neville Chemical Company, and Neville's full line of C-I (Coumarone-Indene) resins. Immediately recognizable virtues are: LX-782, very low price; LX-685, high versatility; and LX-1000, very light color. A common virtue of these resins is their immediate availability in large and small quantities, both in the solid and flaked form. Write to us for further information.

**Neville Chemical Company · Pittsburgh 25, Pa.**

NEVILLE®




On our test fleet and under actual driving conditions Gentro-Jet proved its superior durability every time. Here gauges show 31% greater tread life in the tire made with Gentro-Jet 9152 SAF black masterbatch.



# Gentro-Jet®

# improves tread wear up to 30%!

*Fleet road tests prove Gentro-Jet 9152 SAF black masterbatch offers better road wear in tires than any other commercially available rubber-black combination . . . more than 30% better wear than tires made with conventional dry mix. Use Gentro-Jet in your formulations for improved tread wear.*

**GENTRO-JET BLACKMASTERS OFFER:**
**Faster processing • Savings in shipping, storage and handling • Assures cleaner in-plant operation.**

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*Chemical Division*
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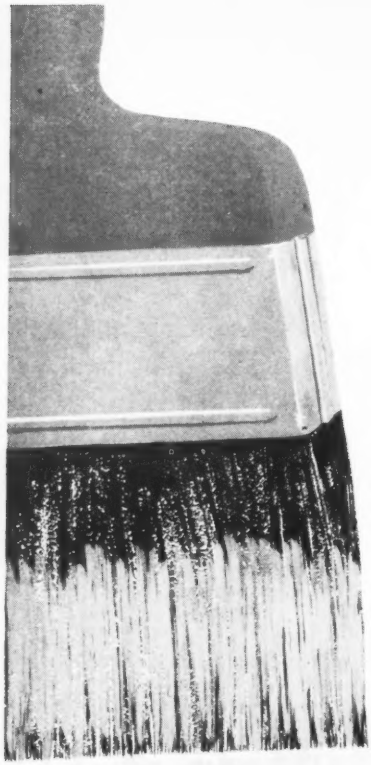
## Chemical Division · Akron, Ohio

*Chemicals for the rubber, paint, paper, textile, plastics and other industries:* **GENTRO SBR** *rubber* **GENTRO-JET** *black masterbatch* • **GEN-FLO** *styrene-butadiene latices* • **GEN-TAC** *vinyl pyridine latex* • **GENTHANE** *polyurethane elastomer* • **ACRI-FLO** *styrene-acrylic latices* • **VYGEN PVC** *resins and compounds* • **KURE-BLEND** TMTD *masterbatch* • **KO-BLEND** *insoluble sulfur masterbatch*



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CORPORATION

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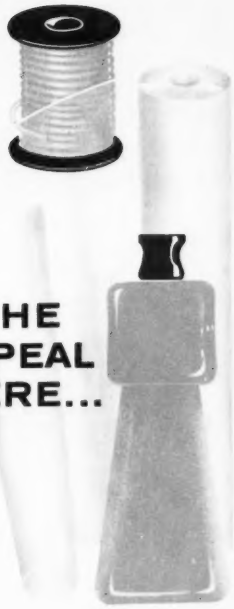

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## PELLETIZED
## Polyethylene Color Concentrates

The consumer impact achieved from finished products of extruded or molded polyethylene is greatly determined by faithful duplication of the original color sample from the designer. For rich, vivid colors or soft, warm colors, matched exactly to the color you desire, STAN-TONE PE Polyethylene Color Concentrates are your answer.

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▶*STAN-TONE PEC Polyester paste* ▶*STAN-TONE Paste*
▶*STAN-TONE GPE 50% Pigment concentrate*

*Our laboratories can solve your specific color compounding problem. For information, contact:*

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**STATEX® 160** Super Abrasion Furnace **SAF**
**STATEX 125** Intermediate Super Abrasion Furnace **ISAF**
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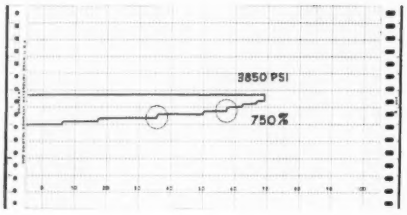
**Read Elastomeric Stress DIRECT IN PSI**

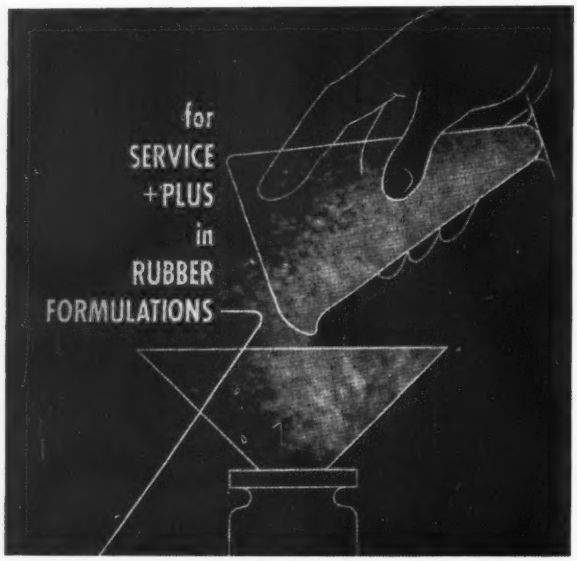



Gauge compensation for direct-in-psi testing of elastomers is another indication of the *built-in* versatility and precision available with Scott's Model CRE electronic tester. The chart shows direct reading made possible through psi calibration and permits extraction, right from the test record, of data in the form desired. The critical qualities of *your* rubber or plastic products can also be evaluated simply, precisely, *and economically* with the Scott Model CRE tester. Write for CRE Brochure.

SCOTT TESTERS, INC., 90 BLACKSTONE ST., PROVIDENCE, R. I.

**SCOTT TESTERS**

THE SURE TEST . . . SCOTT!

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Claremont has served the rubber industry for over thirty years as a supplier of quality flocks produced to fit specific requirements. Whether used inside or outside, as a filler or as a finish, the superiority of Claremont Cotton Flocks is recognized by all users.

Used as a compounding agent in the manufacture of mechanical rubber goods and general sundries, Claremont Flock Fillers provide reinforcement, improve tear and abrasion resistance. Claremont flock finishes for rubber fabrics provide a wide range of appealing textures that are uniform and long-wearing. In many applications the proper use of a Claremont flock will substantially reduce production costs.

Claremont's knowledge of the industry's needs and its capacity for large production and quick delivery have made it the country's foremost producer of cotton flocks. Samples will be furnished upon request for laboratory and test runs. Inquiries invited!

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CLAREMONT, NEW HAMPSHIRE

*The Country's Largest Manufacturer of Flock*

# TECHNICAL BOOKS

## BOOK REVIEWS

**"Plastics Engineering Handbook** of The Society of the Plastics Industry, Inc." Third Edition. Cloth, 7¼ by 10¼ inches, 565 pages. Published by Reinhold Publishing Corp., New York, N. Y. Price, $15.00.

This third edition of the "Plastics Engineering Handbook of The Society of the Plastics Industry, Inc.," is a revised, expanded, up-to-date reference on plastics materials, methods, and fabrication. This new edition adds the advances made since 1954, advances so numerous that the handbook now appears in a larger, double-column format.

There is much new material on nomenclature, cellular plastics, decorating, welding, and plastics as adhesives. The book describes practically every step in the manufacturing operation and includes the experience and know-how of more than 200 technicians and authorities.

The text is fully illustrated with hundreds of photographs, tables, and charts. Some of the charts alone provide data which should be of value to the plastics plant. This definitive guide to the plastics industry contains considerable current information.

This reviewer suggests that a book of this nature in the form of a rubber engineering handbook also is needed by the industry.

**"Fringe Benefits."** By Francis M. Wistert. Cloth, 5¼ by 7½ inches, 164 pages. Published by Reinhold Publishing Corp., New York, N. Y., 1959. Price, $3.75.

This book, one of the Management Science Series, provides an all-inclusive coverage of the history, cost, and economic significance of known fringe benefits of regional, industrial, or national importance, with forecasts of their further development.

Fringe benefits may be described as payments other than wages to employes for their services. This group includes Social Security pensions, and disability benefits, unemployment insurance, temporary disability insurance, group life and health insurance, pensions, vacations, holidays, and sick leave. Also included are workmen's compensation, severance pay, rest periods, overtime pay, workshift premiums, and pay for jury duty, death in the family, voting, and other off-time-periods. Labor's objection to the labeling of vacations, holidays, and rest periods as fringe benefits is not accepted by the author.

The book is written to make it readily adaptable for instructional use or as a complete reference for labor and management personnel. The book also outlines cost analysis for benefit programs and evaluates fringe benefits in terms of employe attitude.

## NEW PUBLICATIONS

**"Heels and Soles**—Formulations and Compounding Techniques." The Goodyear Tire & Rubber Co., Akron, O. 38 pages. The results of heel and sole compounding and testing studies conducted by Goodyear's chemical division appear in this brochure. Proven formulations for practically all specification requirements are listed for major types of heels and soles as well as for toplifting and midsoling materials. New industry developments, such as integral molded footwear, are also discussed. Chapters dealing with the application possibilities of Plioflex, Chemigum, and Pliolite materials are offered.

*(Continued on page 790)*

# NAUGATUCK POLYGARD®

## Typical Formulas Containing Polygard-Stabilized SBR

### MOLDED SOLE COMPOUND

| | |
|---|---|
| SBR 1502 | 100.0 |
| KRALAC® A-EP | 40.0 |
| Zinc Oxide | 5.0 |
| Hard Clay | 15.0 |
| Calcium Silicate | 75.0 |
| Yellow Oxide | 4.5 |
| Red Oxide | 0.5 |
| Hard Para Coumarone Indene Resin | 12.0 |
| Stearic Acid | 1.5 |
| Naugawhite Powder | 1.0 |

### FLOOR TILE COMPOUND

| | |
|---|---|
| SBR 1061 or 1006 | 100.0 |
| NAUGAWHITE POWDER | 1.5 |
| Sulfur | 7.0 |
| Coumarone Indene Resin | 7.5 |
| Zinc Oxide | 7.5 |
| KRALAC A-EP | 12.0 |
| Heavy Calcined Magnesia | 12.5 |
| Silene EF | 10.0 |
| Stearic Acid | 2.0 |
| SUNPROOF JR.® | 2.0 |
| Titanox RA | 20.0 |

| | |
|---|---|
| 10% Modulus | 720 |
| Tensile Strength | 920 |
| Elongation | 60 |
| Hardness (Shore D) | 45 |

| | |
|---|---|
| M-B-T-S | 2.0 |
| TUEX® | 0.2 |
| Sulfur | 3.0 |
| | 259.7 |

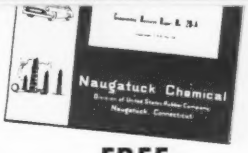
**PHYSICAL PROPERTIES**
(Cure 10 min. at 320°F.)

| | |
|---|---|
| Tensile Strength (psi) | 1650 |
| 100% Modulus (psi) | 680 |
| 300% Modulus (psi) | 1290 |
| Elongation at Break (%) | 430 |
| Shore A Hardness | 95 |

| | |
|---|---|
| Hard Clay | 200.0 |
| Dry Ground Whiting | 150.0 |
| M-B-T-S | 2.5 |
| B-I-K | 1.25 |
| RETARDER E-S-E-N | 0.5 |
| | 536.25 |

**PHYSICAL PROPERTIES**
(Cure 6 min. at 325°F.)

| | |
|---|---|
| Mooney Scorch at 250°F. | 8' |

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# insures that brightest colors stay bright in SBR

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- provides excellent heat stability
- prevents resinification during manufacturing and storage

POLYGARD is backed not only by extensive research and test facilities, including a thoroughly equipped pilot plant, but by *years of highly successful commercial use*. Well-qualified technical service representatives are always available to assist you in the application of this or *any* of Naugatuck Chemical's full line of quality rubber chemicals. And POLYGARD production facilities have been increased to meet the growing demand.

For a bright future for *your* rubber products—insist on the best. Be sure the SBR you buy or sell contains POLYGARD.

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**Division of United States Rubber Company** Dept. A Elm Street Naugatuck, Connecticut

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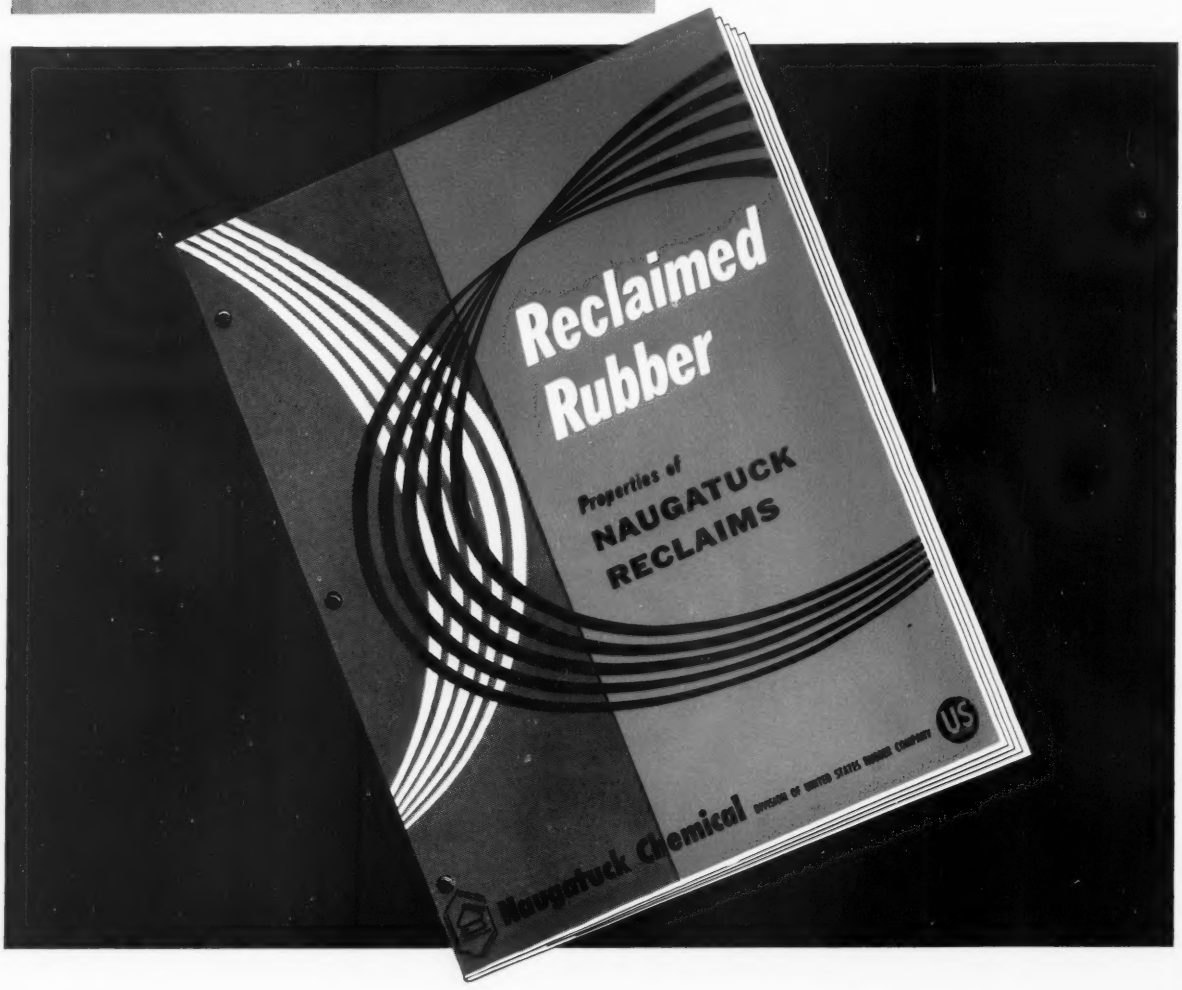
# Naugatuck RECLAIM




## Reclaimed rubber . . . in many ways better than new!

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Here in fast, easy-to-use form is the information you want and *should have* on the many types of reclaimed rubber available from Naugatuck, long a leader in the field.

The many processing and product advantages are discussed, with reclaims classified as to source as well as application. Technical descriptions of 35 specific Naugatuck rubber reclaims are included.

If you have not received your free copy of what is probably the most useful manual of its type ever published, simply send the coupon at right.

For fully qualified technical assistance in the use of reclaimed rubber, for any application, contact your local Naugatuck Representative.

Naugatuck Chemical, 310E Elm Street, Naugatuck, Conn.
Division of United States Rubber Company

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US RUBBER

## United States Rubber

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THE OIL-RESISTANT, OZONE-RESISTANT NITRILE RUBBER

## Great new advance in automotive rubber

Here is a new rubber that's unmatched for oil, weather, and abrasion resistance. It's new PARACRIL® OZO, the finest achievement yet in the nitrile rubber field. PARACRIL OZO's properties are tailor made for many modern automotive parts—for everything from weather stripping to oil seals and hose. PARACRIL OZO gives you a whole series of important advantages, including:

- significantly superior ozone resistance
- excellent fuel and oil resistance
- several times greater abrasion resistance
- permanent retention of bright colors for exterior styling and easily traceable wiring and other interior parts

Look into PARACRIL OZO. Discover for yourself its new design possibilities...its unlimited color...its high quality. Contact your nearest Naugatuck representative at the address below.

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# 290,000,000 passengers in one year

# make little impression on seat fabric

Public Service Coordinated Transport, owner and operator of 2511 buses in New Jersey, with established routes into the cities of New York, Philadelphia and Wilmington, carried 290,000,000 passengers over 90,000,000 miles in 1958 alone. Impressive as these statistics sound, they made little or no impression on the heavy duty coated fabric upholstery used by the company. So sturdy is this material that much of Public Service's original purchase, made in 1947, is still standing up under everyday use.

In making Koroseal, the supported vinyl upholstery material producing these amazing wear results, B. F. Goodrich looks to Wellington Sears for the strong fabric backing it requires . . . one of the many Wellington Sears fabrics engineered for specific jobs of all kinds.

For cotton or synthetic industrial textiles, more and more companies are turning to Wellington Sears—and taking advantage of our more than a century of experience in providing fabrics to industry. For help in your own fabric applications, write for technical assistance and a free illustrated booklet, "Fabrics Plus," Dept. H-3.

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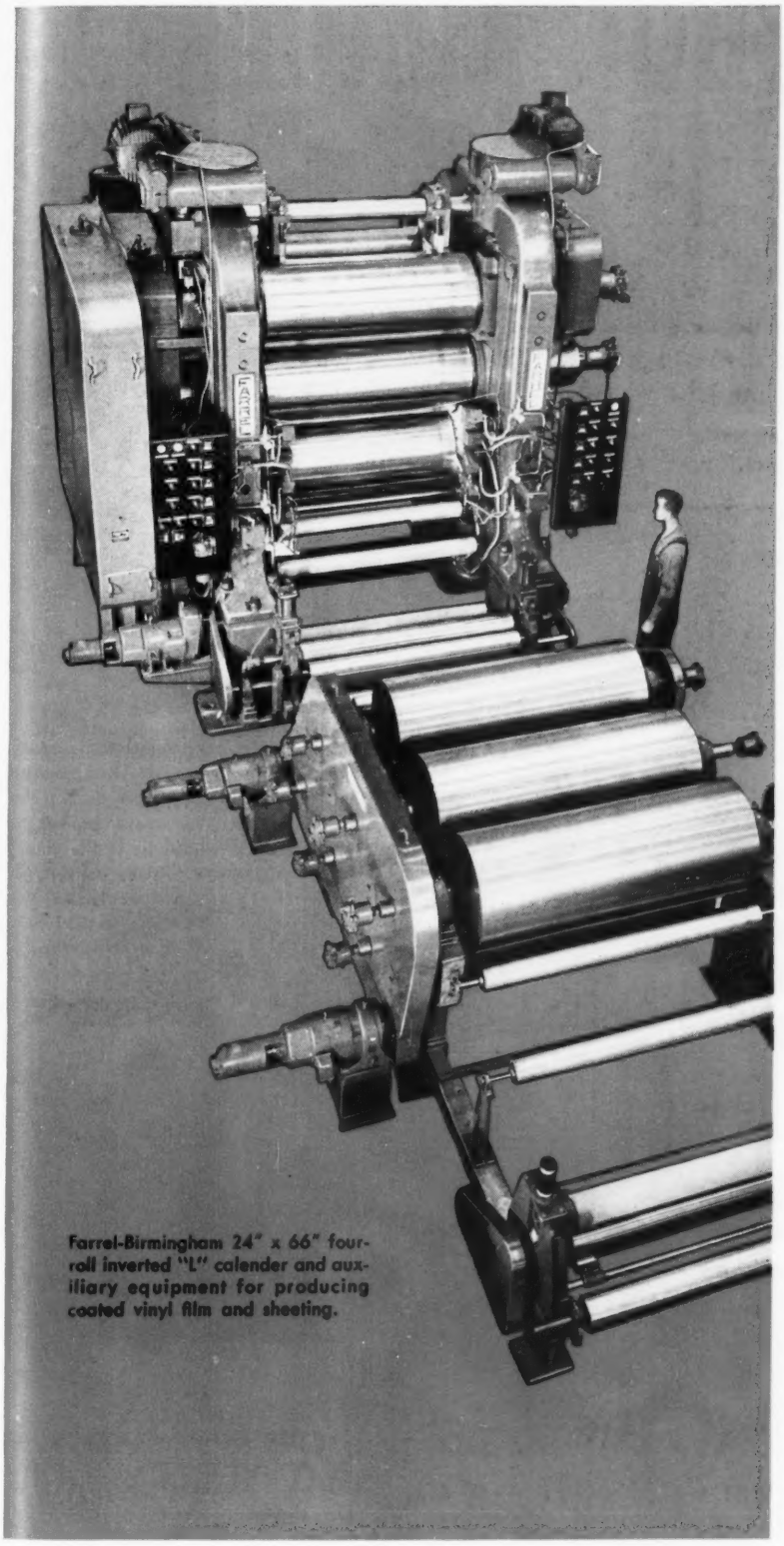
# DUAL-PURPOSE CALENDER TRAIN

*maintains accuracy in producing and coating vinyl film and sheet*



Farrel-Birmingham 24" x 66" four-roll inverted "L" calender and auxiliary equipment for producing coated vinyl film and sheeting.

The calender train shown here was designed by Farrel-Birmingham for producing vinyl film and sheeting, and then coating them with butyl rubber at speeds up to 80 yards per minute. The calender has a motorized crossed-axes device which accurately compensates for roll deflection under the varying conditions of calendering film, sheet and finished product, assuring extremely close gauge control for the final pass for each. A heating and cooling system is furnished to provide the necessary heating range for vinyl material and also the moderate temperatures required for butyl.

Vinyl film is produced in the first operation, then stored in rolls which are later unwound for the coating process. A freshly calendered butyl sheet is laminated with the vinyl film or sheet, after which the combination is cooled, wound up, and subsequently slit into tape-width strips for delivery. The finished product is used for covering underground pipe lines.

The calender train includes a 24" x 66" four-roll inverted "L" calender, film and sheeting let-off, adhesive coater, two-roll laminator, six cooling rolls, beta-ray gauge, trimming unit and double center windup unit. The calender is driven by a 200 HP motor with adjustable-voltage control. Complete synchronization is provided for all train units.

A Farrel engineer will be glad to help you select a calender for your specific needs. Call today.

**FARREL-BIRMINGHAM COMPANY, INC.**
**ANSONIA, CONNECTICUT**

*Plants:* Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.

*Sales Offices:* Ansonia, Buffalo, Akron, Ann Arbor (Mich.), Chicago, Los Angeles, Houston, Atlanta

*European Office:* Piazza della Republica 32, Milano, Italy

FB-1186

FARREL®

# QUALITY PRODUCTION CONTROL PROTECTS

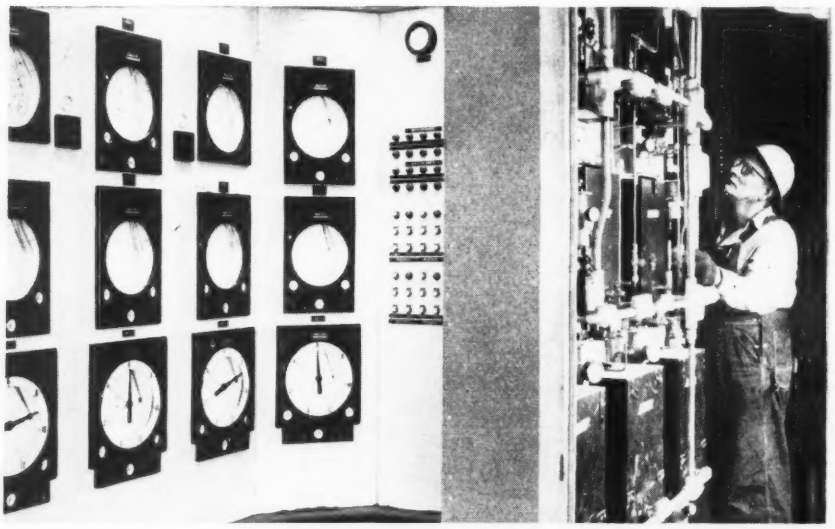
# YOUR **CARBON BLACK** DOLLAR

# AT

# WITCO-CONTINENTAL

**At Witco-Continental, experienced personnel control carbon black production with modern instrumentation techniques and complete laboratory testing. As a result, Witco's fully automated controls yield a continuously uniform product.**

**Furthermore, because Witco laboratories are located at plant sites, immediate testing results in faster production schedules. So, when you purchase carbon blacks, be sure you insist on highest quality—insist on WITCO-CONTINENTAL.**



Centralized instrument panels, part of the fully instrumented production controls in use at Witco-Continental, record the continuous operating conditions in the plant. Temperature control points, recorders and automatic alarm systems evaluate and control conditions to assure a constantly uniform product. Start-up and shutdown for cleaning operations are push-button procedures.

Feed stock meters critically control hydrocarbon feed... play a vital part in the achievement of uniformity of black properties. Here, an operator conducts a routine inspection.

As a final check on production control, physical testing of the black itself and testing in rubber are performed by highly skilled rubber technicians. Witco's modern plant site laboratories make possible on-the-spot testing geared to the continuous production of carbon black that meets customer requirements. Test results are fast. There is no lag between production and evaluation. Production control is constant and uniform.

WITCO®

**WITCO CHEMICAL COMPANY, Inc.**
**CONTINENTAL CARBON COMPANY**

122 East 42nd Street, New York 17, N. Y.

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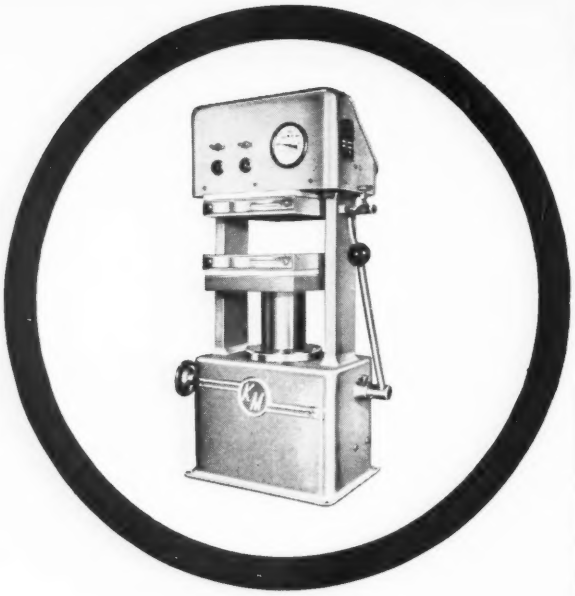
Sales Offices in Chicago • Quincy-Boston • Akron • Atlanta • Houston • Los Angeles • San Francisco • Toronto and Montreal, Canada (Soden Chemicals Division) • London and Manchester, England • Glasgow, Scotland • Rotterdam, Holland



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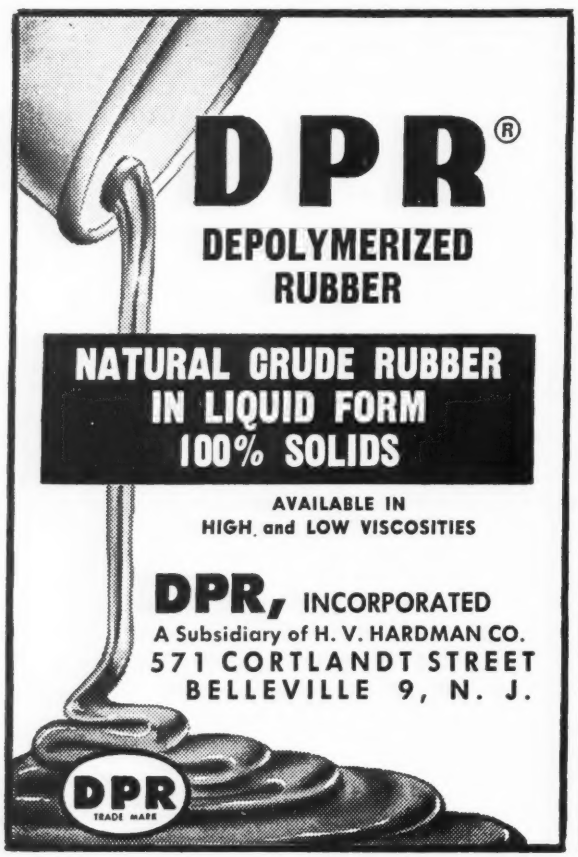



## Technical Books

*(Continued from page 782)*

**"Water Absorption Characteristics of Non-Black Reinforcing Fillers."** Bulletin No. 19. By Ralph F. Wolf. Columbia-Southern Chemical Corp., Barberton, O. 28 pages. This bulletin presents a comparison of Hi-Sil 233 with a sodium silico aluminate in a variety of compounds based on both natural and synthetic rubbers. Two types of compounds were used. Evaluations were made both in simple laboratory recipes and in typical production recipes used in the soling, wire and cable, molded and extruded goods, and roll covering fields.

**"GE Silicones."** CDS-129B. General Electric Co.'s silicone products department, Waterford, N. Y. 8 pages. This illustrated bulletin is the 1960 guide to the company's complete line of silicone products. Listing major product uses and benefits, the bulletin features silicones for: antifoam and release agents, lubricants, paper releases, cosmetics and polishes, masonry water repellents, paint and paint additives, textile finishes, and electrical insulation. Another section is devoted to silicone rubber, including liquid RTV (room temperature vulcanizing) silicone rubber compounds.

**"Ketones."** Union Carbide Chemicals Co., division of Union Carbide Corp., New York, N. Y. 48 pages. This booklet describes 15 ketones and diketones as solvents and chemical intermediates which are available in commercial quantities from Union Carbide. The bulletin includes information on applications, coatings, formulations, physical properties, solvent properties, constant-boiling mixtures, shipping, storage, handling, physiological properties, specification limits, and test methods. A comprehensive bibliography on ketones and their uses is featured.

**"Carbon Blacks for Paint."** Godfrey L. Cabot, Inc., Boston, Mass. 16 pages. This booklet describes the company's extensive line of carbon black pigments available for use in the protective and decorative coatings industry and provides general information on how to select and disperse the proper carbon black grade for a particular application.

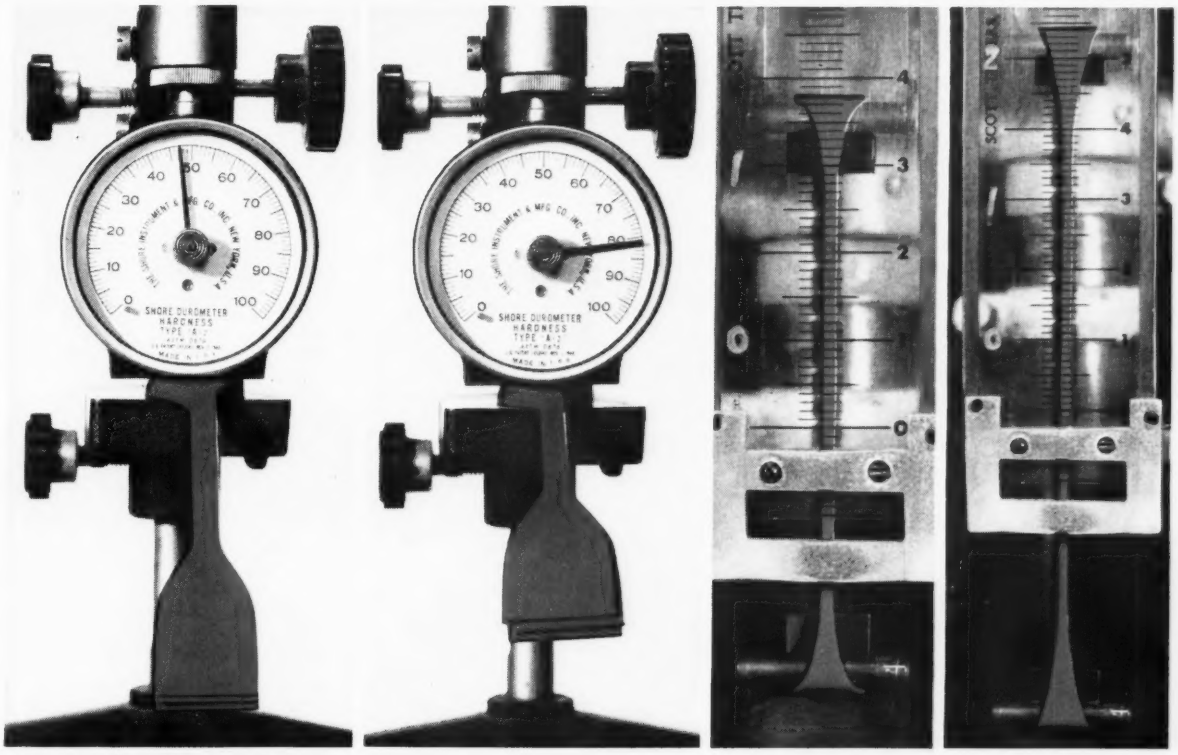
**"Minstron Rubber Reports."** Sierra Talc Co., South Pasadena, Calif. These reports provide compounding information on the use of Minstron white reinforcing pigments in rubber compounds. Minstron pigments are ultra-fine, high-purity magnesium silicates. Berkshire Chemicals Inc., New York, N. Y., is sales representative for Sierra Talc.

**"Special and Flexible Handling Equipment."** Bulletin 222-1. Lewis-Shepard Products, Inc., Watertown, Mass. 6 pages. This new case-history bulletin describes how the United States Rubber Co.'s Winnsboro Mills achieved a flexible handling system that offers a faster and more efficient operation—in spite of highly specialized handling problems. This two-color bulletin is fully illustrated with a series of action shots taken at the plant. All phases of the operation are described by photos and fully explained.

**"Welding Pad Gages."** Data Unit No. 362. Jerguson Gage & Valve Co., Burlington, Mass. 2 pages. This data sheet offers features and specifications on welding pad gages which can be welded on to a tank, still, vessel, or other liquid-containing structure, thus becoming an integral part of it. This bulletin also describes both reflex and transparent-type gages.

**"Ozone Research and Equipment Corporation."** Ozone Research & Equipment Corp., Phoenix, Ariz. 10 pages. This illustrated brochure provides general information and specifications on the company's various models of automatically and manually controlled ozone test chambers. Descriptions of operation and a section on accessories and services are presented. This brochure and related bulletins are available from the company.

# Pick A Property; Compound It!

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All this, and a simpler inventory, too!

**Sample Recipes and Typical Properties**

| | |
|---|---|
| . . . For 50 Durometer Silastic | |
| Silastic 433 Base | 100 parts |
| Cab-O-Sil MS-7 | 7 parts |
| Celite Super Floss | 3 parts |
| Luperco CSF or Cadox TS-40 | 1.8 parts |
| * Durometer (Shore A) | 50 |
| Tensile strength, psi | 800 |
| Elongation, % | 240 |
| Tear Strength, lbs/in | 60 |
| . . . For 80 Durometer Silastic | |
| Silastic 433 Base | 100 parts |
| Cab-O-Sil MS-7 | 28 parts |
| Luperco CSF or Cadox TS-40 | 1.8 parts |
| * Durometer (Shore A) | 80 |
| Tensile strength, psi | 700 |
| Elongation, % | 150 |
| Tear strength, lbs/in | 85 |

* Vulcanized 5 min. at 240 F; cured 24 hours at 480 F.

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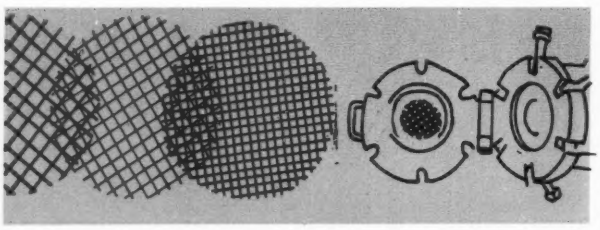

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## Technical Books

Publications of the Enjay Co., Inc., Butyl division, New York, N. Y.:

**"Sulfur-Donor and Low Sulfur-High Accelerator Cures."** Bulletin 121. 4 pages. The properties of butyl vulcanizates with sulfur-donor, low sulfur-high accelerator, and conventional sulfur systems were compared in a laboratory study. Test results, state of cure, comparison with resin cure, and applications are presented.

**"Construction and Performance of Butyl Tires."** Bulletin 651. Recent work on the balance among design, construction, and compounding has resulted in commercial all-butyl passenger-car tires that are said to be equal to SBR tires in all respects, with added advantages of improved braking traction and smoother, quieter, squeal-free ride. This bulletin presents some recent data and theories on why all-butyl tires perform as they do.

Publications of Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.:

**"Paracril Ozo for Shoe Soles."** Bulletin No. 232. By I. E. Cutting. 12 pages. Shoe soles manufactured from Paracril Ozo are said to have exceptional abrasion resistance, excellent fuel and oil resistance, low specific gravity, and good resistance to flexing. This bulletin gives seven different sole formulations and vulcanizate properties. Material costs are also provided.

**"Naugawhite Powder."** Bulletin No. 224. By D. G. Gillette. 8 pages. This bulletin describes a powder form of Naugawhite, an economical and effective non-staining, non-discoloring bisphenolic-type antioxidant for rubber. Various recipes and vulcanizate properties are given. Physical and compounding properties of Naugawhite Powder also are included.

**"Celogen-AZ**—A Nitrogen Blowing Agent." Bulletin C-101. 7 pages. This technical bulletin gives data for expanding polyethylene, polypropylene, calendered and plastisol vinyl foams with Celogen-AZ (azodicarbonamide). Physical properties of the nitrogren blowing agent are listed, and compounding and processing information is included.

**"Celogen**—A Nitrogen Blowing Agent." Bulletin C-102. 4 pages. This bulletin describes the use of Celogen, p,p'-Oxybis (benzenesulfonyl hydrazide), as a blowing agent for cellular polyethylene and unicellular expanded poly(vinyl chloride). Formulations and processing data are provided.

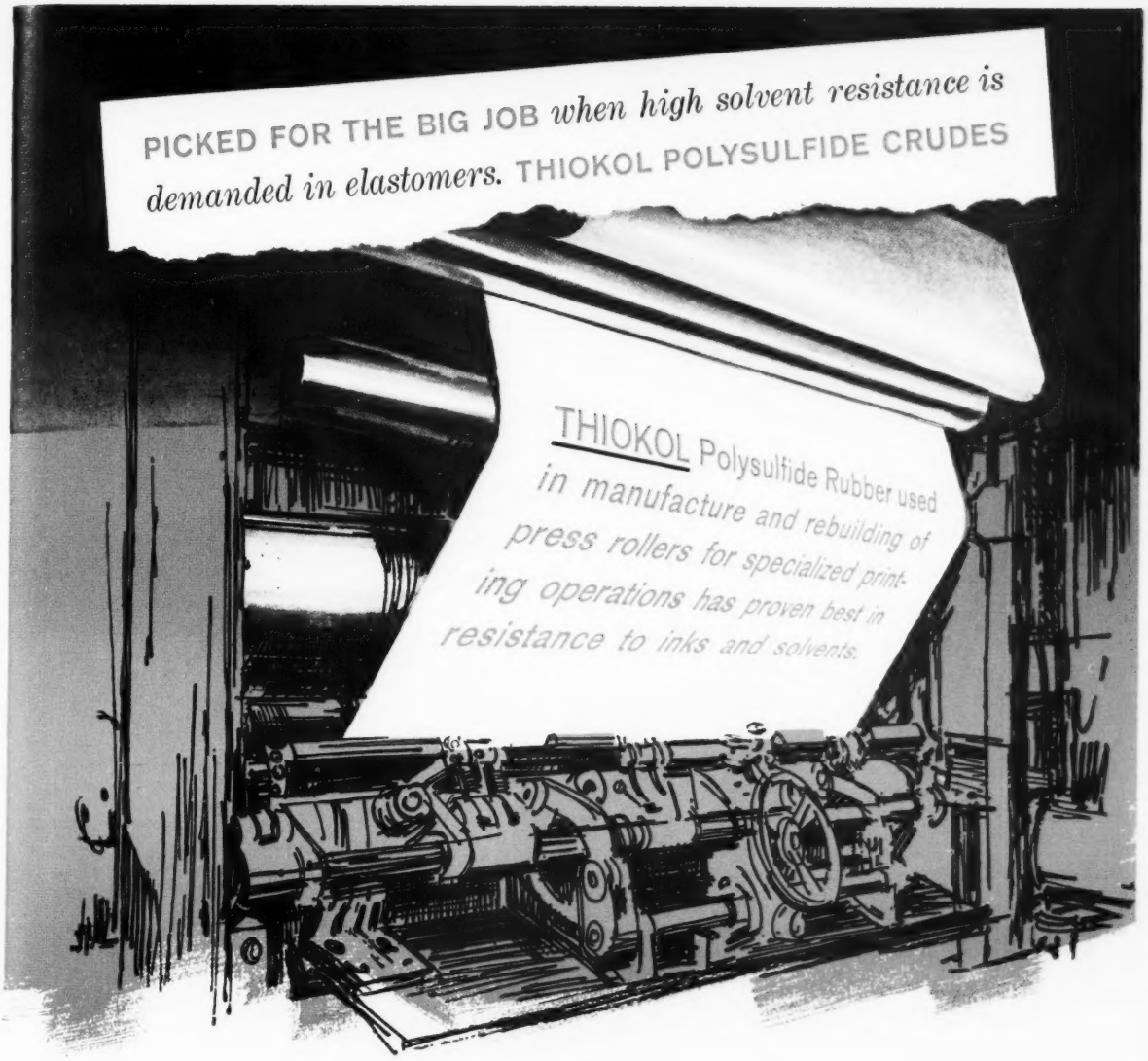
Publications of The British Rubber Producers' Research Association, Welwyn Garden City, Herts, England:

**"The Compression of Bonded Rubber Blocks."** No. 324. By A. N. Gent and P. B. Lindley. 16 pages. Experimental measurements are described of the load-deflection relations for rubber blocks having a wide range of thicknesses and varied shapes of cross-section. The measured stiffnesses for small compressions are shown to be in good agreement with theoretical predictions for a non-black vulcanizate.

**"The Strain-Dependence of Rubber Visco-Elasticity.** Part I. The Region of Moderate Strain." No. 325. By P. Mason. 16 pages. A method is described by which the strain dependence of each component of the dynamic Young's modulus may be represented at a given temperature and frequency by two parameters. Values of the modulus components for natural, butadiene-acrylonitrile, and butyl rubber were derived.

**"Depolymerized Rubber-Monomer Compositions."** No. 326. By D. J. Elliott and W. F. Watson. 14 pages. Mixtures of degraded natural rubber and styrene which can be poured into a mold and polymerized and vulcanized are described. The products have higher tensile strengths, tear strengths, moduli, and hardness values than vulcanized degraded rubber alone.

**"The Influence of Strain upon the Dynamic Properties of Natural Rubber."** No. 329. By P. Mason. 14 pages. The dynamic properties of natural rubber in simple extension have been measured, using a wave propagation technique. From measurements of the temperature-dependence of the loss factor it appeared that the glass transition temperature was not greatly influenced by extension. Reduction of the data was therefore carried out by Ferry's method of reduced variables using a single reference temperature for all extensions.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## Technical Books

**"Environmental Test Chambers and Equipment."** Associated Testing Laboratories, Inc., Caldwell, N. J. 2 pages. This data sheet describes and illustrates 13 different types of environmental test equipment including an acoustic-noise test system, auxiliary vibration (slippery) tables, and saw-tooth shock machines, as well as the firm's large line of environmental test chambers. Associated, in addition to its manufacturing facilities, maintains a space reliability center for environmental testing of missile and aircraft components and systems.

**"Joy WN-114 Air Compressors."** Joy Mfg. Co., Pittsburgh, Pa. 24 pages. This new bulletin describes the WN-114 stationary compressor and includes specifications on three basic models of the semi-radially constructed units ranging from 1385 cfm. to 1948 cfm. at 125 psi. Information on package design, components, intercooling, lubrication, motor mountings, and accessories are fully illustrated and explained.

**"Stillman O-Rings."** Stillman Rubber Co., Culver City, Calif. 8 pages. This two-color brochure lists and describes Stillman O-rings for all phases of industry. Tables showing sizes, dimensions, cross-sections, diameters, seal materials, and other important information are presented. Included are military specifications, resistance to heat, cold, chemicals, and other environmental factors.

**"Directory of Plastic Packaging Suppliers."** Directory C-10-211. Plastics division, Koppers Co., Inc., Pittsburgh, Pa. 36 pages. This directory is provided as a service to the packaging industry to assist in the selection of sources for plastics packages. The directory lists both custom and proprietary plastics packaging molders and extruders in the United States, in alphabetical order. Information listed under each company name includes a description of the type of service it is equipped to provide and the names of company officers.

**"TEMA Standards."** Tubular Exchanger Manufacturers Association, New York, N. Y. 144 pages. This new edition, the fourth since 1941, of TEMA standards provides detailed information on the design and the engineering of tubular heat exchangers. The book contains specially prepared engineering data not available elsewhere. Besides complete sections outlining the mechanical standards for both Class R and Class C exchangers, the standards include a wealth of thermal data, material specifications, and general design information.

## Vultafoam Prepolymers

*(Continued from page 770)*

including the insulation of refrigeration cabinets; flotation for boats; void fillers for submarines; and as packaging material for perishable goods and delicate instruments.

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|---|---|
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| Shrinkage | none |
| Cell structure | fine |
| % Closed cells | 90–95 |
| K factor (BTU/hr/sq. ft./in./°F.) | 11–.14 |
| Yield strength at 10% | 34 |
| Foam time | 3–5 minutes |
| Hardening time | 10–15 minutes |
| Cure | room temperature |

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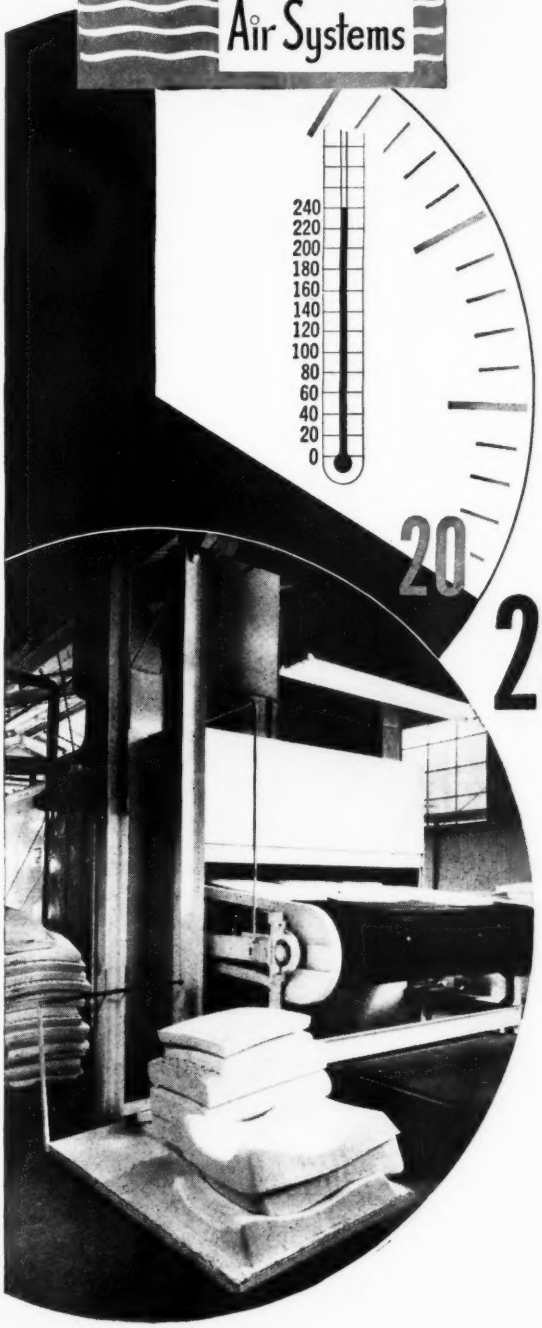


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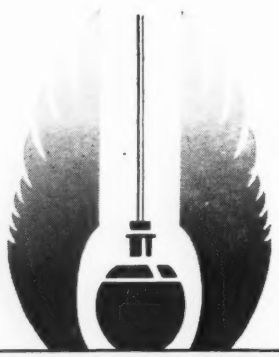

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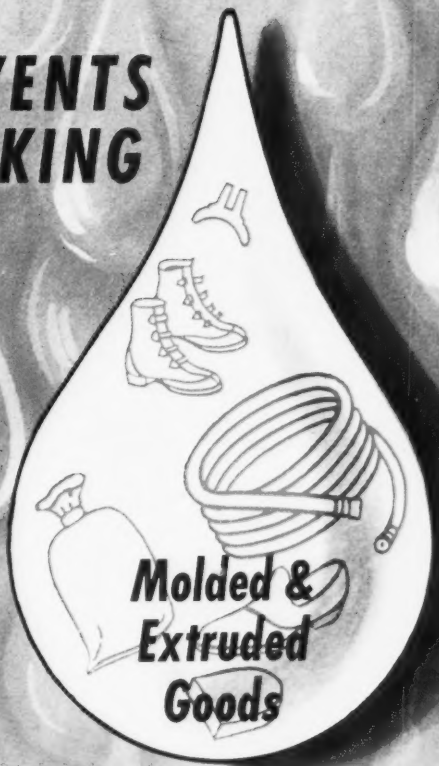


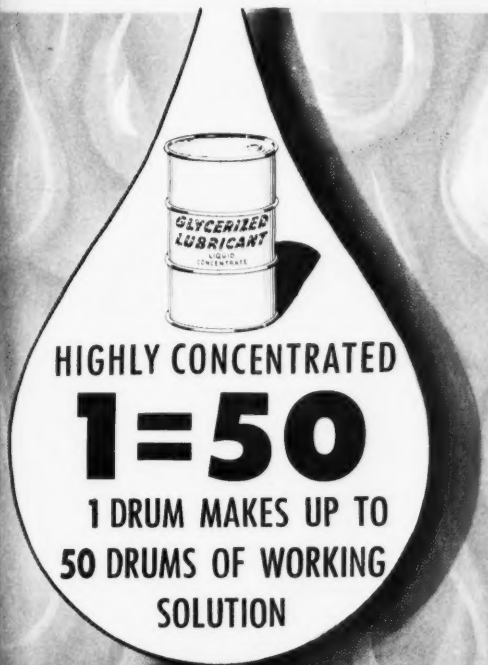


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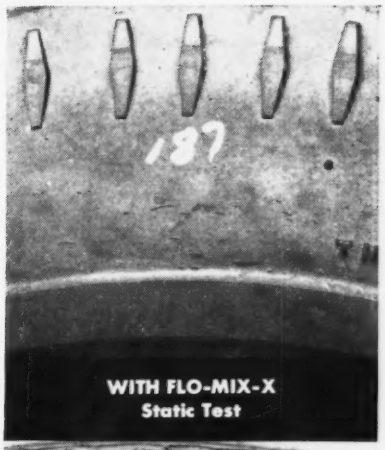


WITH FLO-MIX-X
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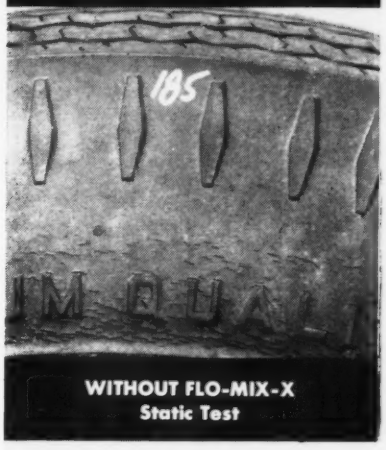


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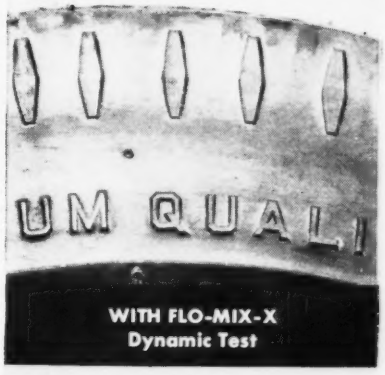


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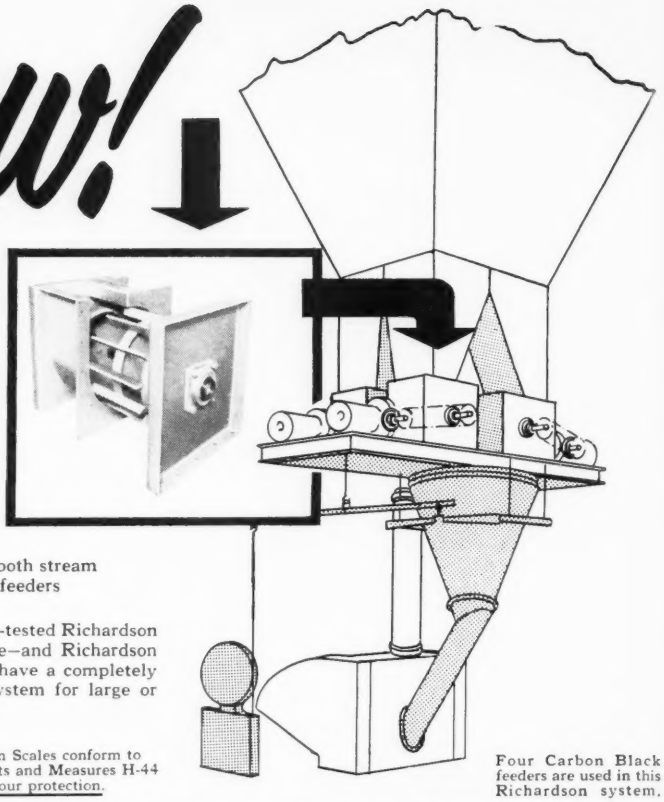

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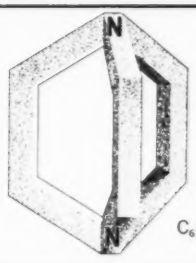


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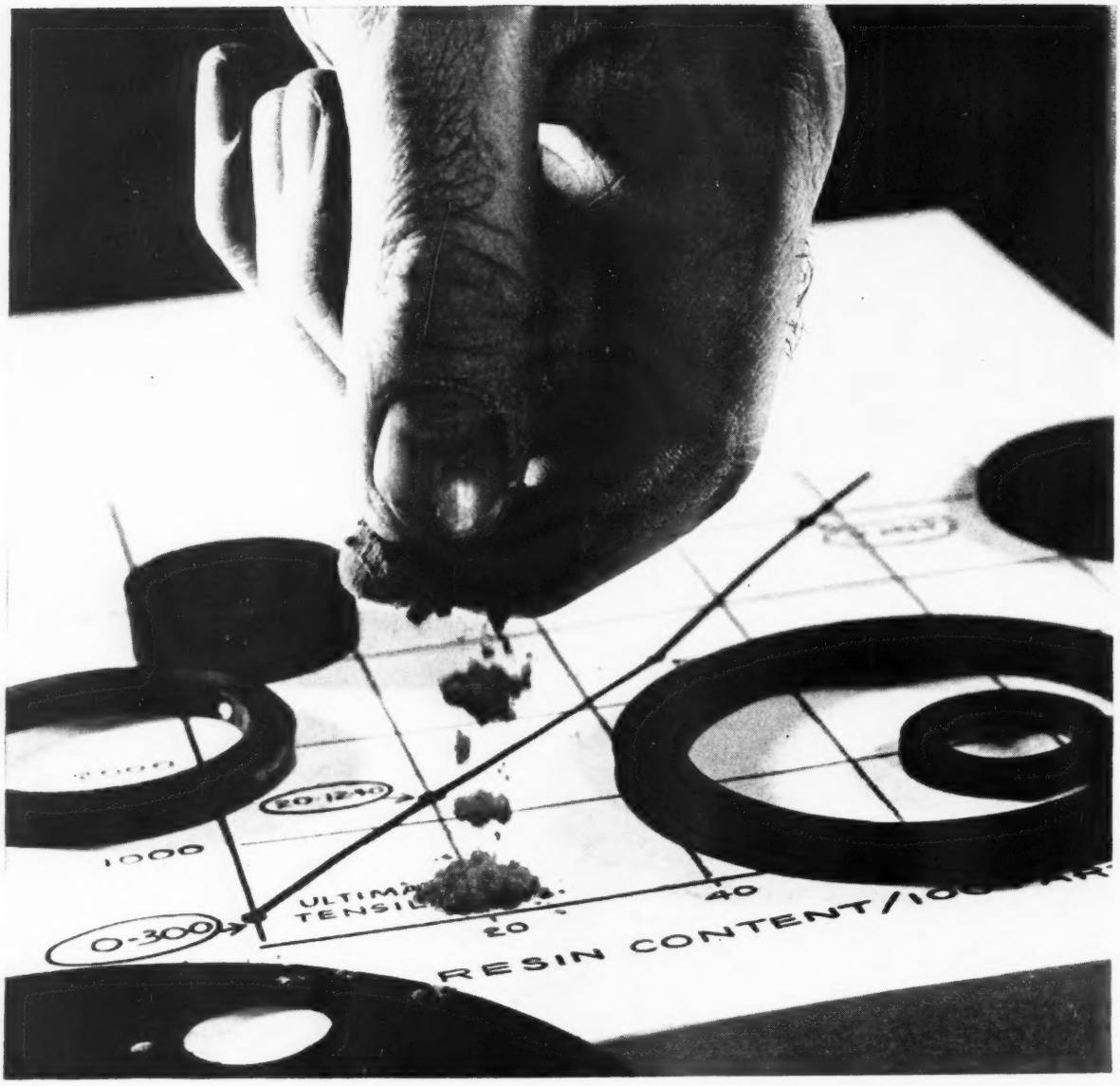


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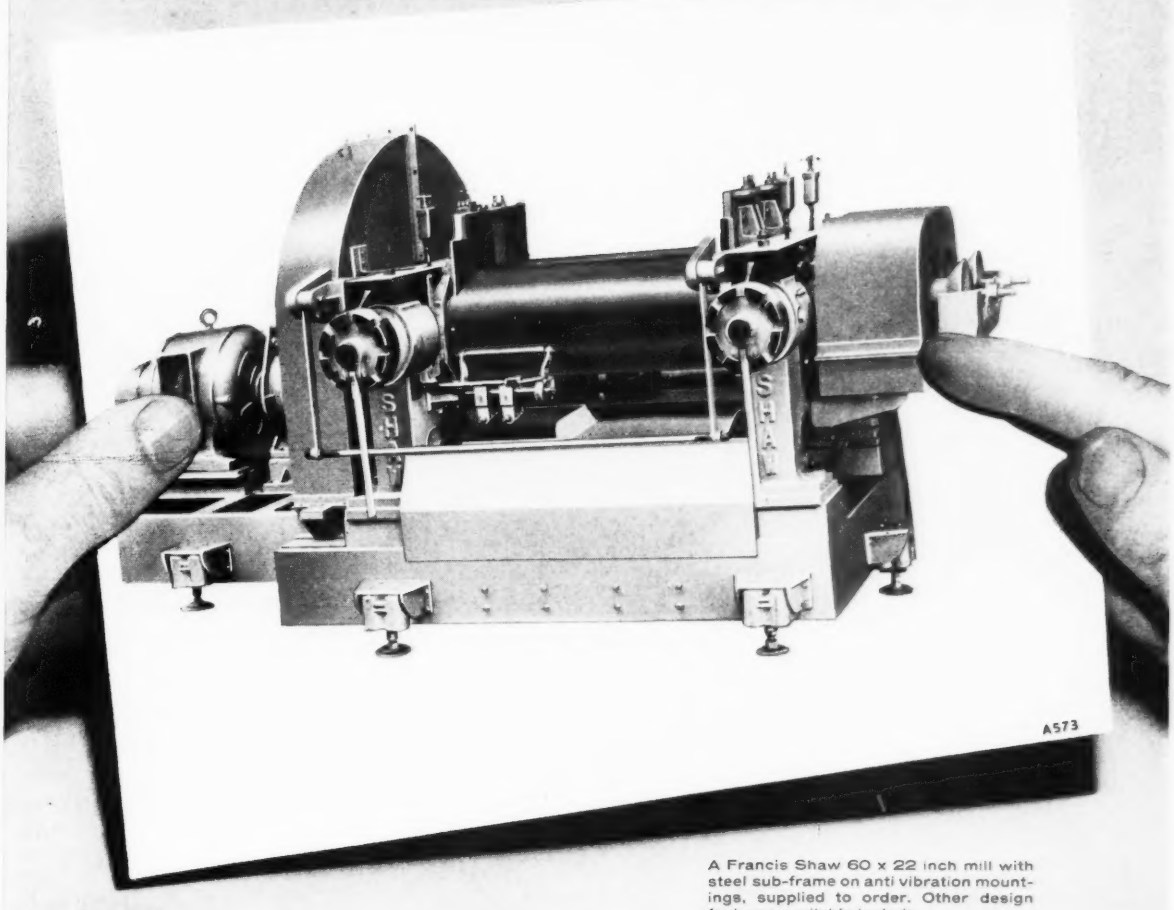


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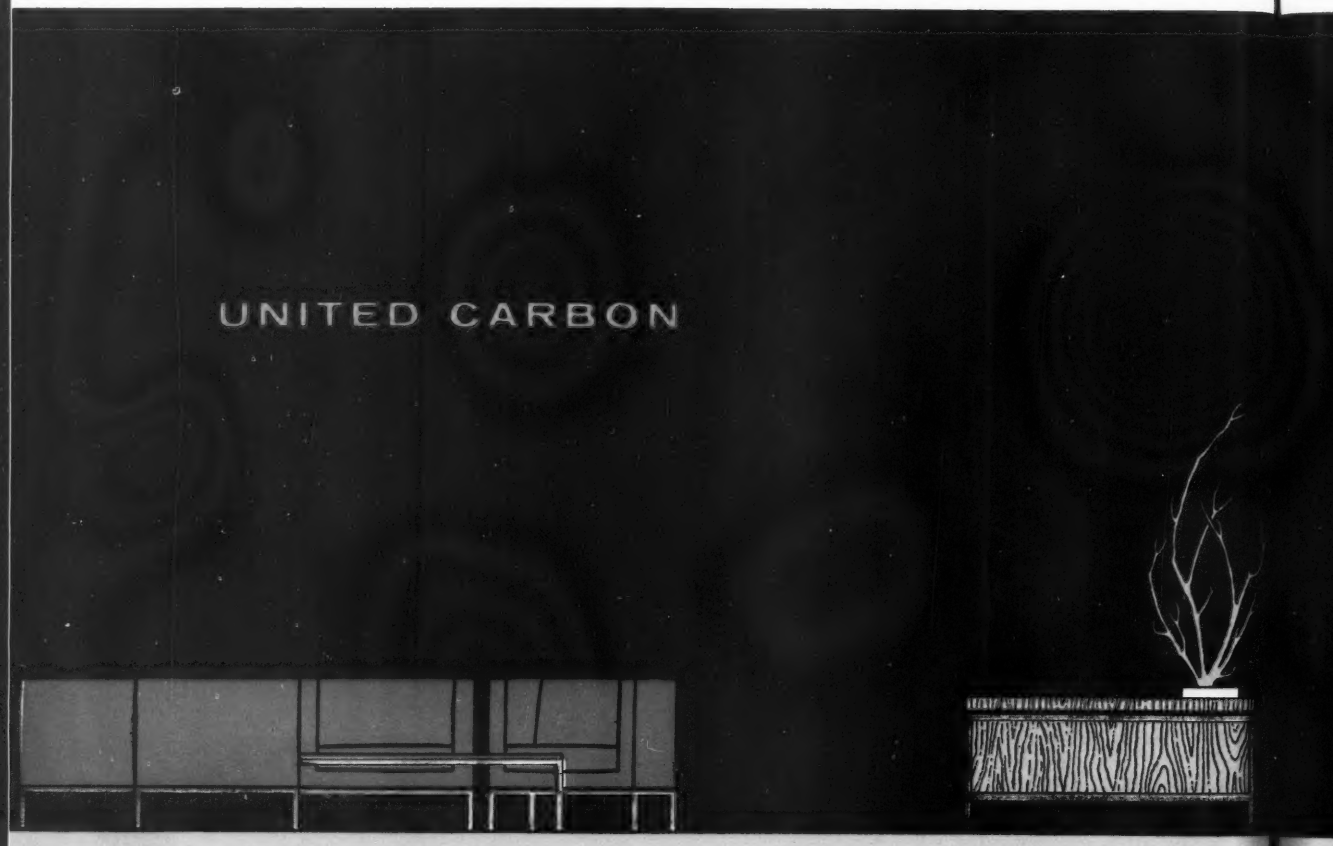


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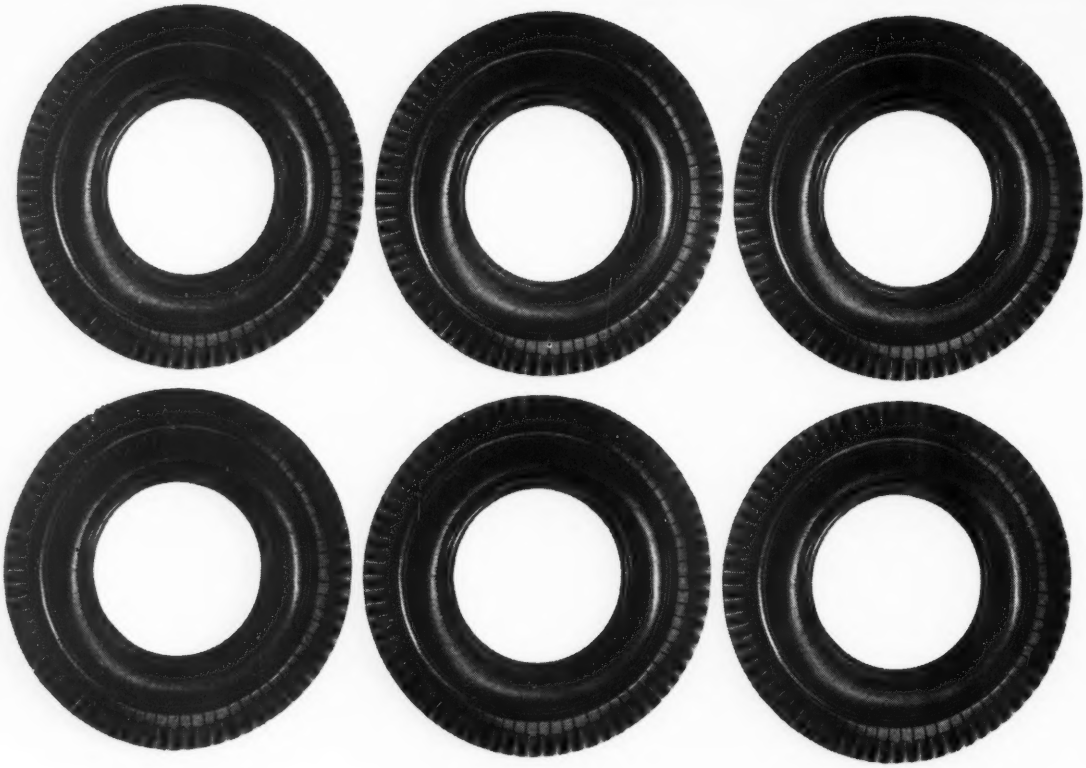

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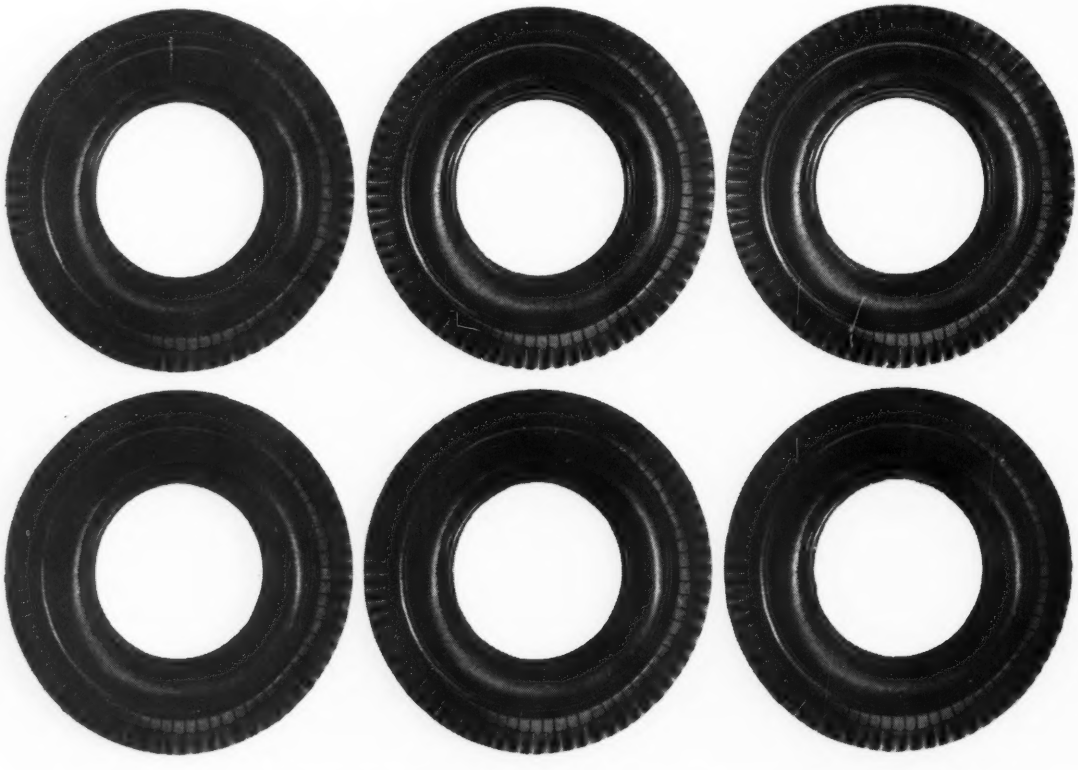

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RUBBER WORLD
EDITORIAL

# Natural Rubber Testing; More Technical Approach Developing?

THE Rubber Manufacturers Association, Inc., has authorized its Crude Rubber Committee to hold a Third International Rubber Packing and Quality Conference in Singapore next September to consider a revision of the 1957 book entitled, "Type Descriptions and Packing Specifications for Natural Rubber Grades Used in International Trade." One of the purposes of the Conference will be to eliminate the overlapping of six RMA and six Singapore grades and to substitute internationally agreed upon visual inspection standards for the six. It is suggested that the Conference give consideration also to recent developments in the testing of natural rubber and the growing world-wide interest in means of evaluating natural rubber on a more technical basis.

Subcommittee 12 on Crude Natural Rubber of Committee D-11 of the American Society for Testing Materials has developed methods and tentative limits for certain chemical tests for Nos. 1 and 1X Smoked Sheets and Pale Crepes. The ASTM limits for copper and manganese are the same as those already required by the RMA. The ASTM limits include several other requirements such as those for dirt and volatile matter. Representatives of natural rubber producers recently agreed that these ASTM limits, with some modifications, could be met by the grades in question at the present time, but objected on economic grounds to the establishment of any new requirements.

At the International Rubber Conference in Washington, D. C., in November, 1959, J. E. Morris and B. C. Sekhar, of the Rubber Research Institute of Malaya, reported in a paper on recent developments in natural rubber, however, that "control of any estate production or any lot of packing house rubber in Malaya can be carried out by testing sections of the RRIM, at the request of the estate packer or buyer, and advice can be given to obtain technical properties required."

At the eighth meeting of the Technical Committee 45 on Rubber of the International Organization for Standardization in New York in October, 1959, the assignment to develop specifications for natural rubber was given to the appropriate Working Group. This request for natural rubber specifications originated with certain European consumers. The United States is represented by members of ASTM D-11 on ISO/TC 45.

The Natural Rubber Bureau, which represents Malayan rubber producers in the United States, has announced the establishment of a Technical Service Department in this country for the purpose of making sure that new developments in natural rubber receive proper attention, and that regular grades are used most effectively.

It would seem that a much more technical approach to the marketing, testing, and use of natural rubber is likely to develop in the not-too-far-distant future. This aspect of natural rubber should therefore become a part of the presently planned Rubber Packing and Quality Conference and all future conferences, particularly those held on an international level.

R. G. Seaman
EDITOR

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RUBBER WORLD

# New Rubber Processing Techniques For the Sixties[1]

By ANDREW HALE

*Hale & Kullgren, Inc., Akron, O.*

PRESENT-DAY economics give strong indication that changes are required in rubber processing techniques in the rubber goods manufacturing industry. Now, more than ever before, the costs of labor, the staggering increase in the capital required for processing machinery and for control of product quality, have compelled some process changes. Large rewards are around the corner awaiting those who will take the further necessary and progressive steps.

In 1941, I predicted "The Mill Room of the Future,"[2] which was based on the pelletizing of rubber for automatic weighing and simpler transportation from one operation to another. In the ensuing period of more than 18 years the success of mill rooms patterned after the flow charts shown at that time has more than exceeded our expectations. What we imagined then was projected on far less practical ex-

[1]Based on a paper presented before the International Rubber Conference, Washington, D. C., Nov. 9, 1959. Published with permission of American Chemical Society, who holds copyright on original paper in "Proceedings of International Rubber Conference: Washington, D. C., Nov., 1959."

[2]India RUBBER WORLD, 104, 5, 331, (1941).

Fabian Bachrach

Andrew Hale

## The Author

Andrew Hale, president, Hale & Kullgren, Inc., received his M.E. degree from Cornell University in 1916. He served in World War I as an aviation pilot in the U. S. Navy and was discharged in 1919.

Mr. Hale was employed by the Firestone Tire & Rubber Co. as an industrial engineer until 1923, when he joined Farrel-Birmingham Co., Inc., as manager of its Akron, O., office. In 1945 he joined Adamson United Co. as vice president in charge of sales and engineering, where he remained until 1950, at which time he formed, with G. V. Kullgren, the firm of Hale & Kullgren, Inc.

The author is a member of the National Society of Professional Engineers and the Ohio Society of Professional Engineers, an associate member of the Division of Rubber Chemistry of the American Chemical Society, and a member also of the Masonic Order, Sigma Phi Epsilon, and Akron University, Akron City, and Portage Country clubs.

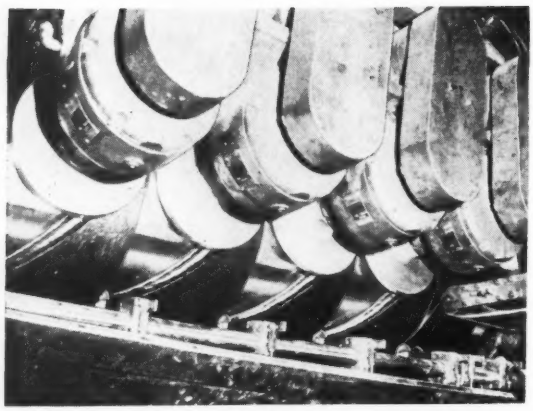

Fig. 1. View of cutting knives and power-driven curling wheels on 26- by 84-inch two-roll mill

perience than that which is available today for our next forward step.

## High-Speed Automatic Mills[3] for Batch or Continuous Mixing

Because of our success during more than 10 years of experimentation, because of valid laboratory proof, and now a successful commercial operation, my associates and I have unquestioned faith in the future accomplishments of our newly designed high-speed automatic two-roll mill. Its mechanization and auxiliary milling devices multiply the work that can be done now on existing lower-speed mills. Consequently, a much greater share of the total required milling can be accomplished in a single unit.

We based our development on the premise that the number of operations required in the preparation of a rubber compound for a tire, molded or extruded goods, etc., could be reduced and, in fact, should be completed in a single operation. Where masterbatching in the Banbury mixer is necessary, we feel that a batch-type automatic mill used with the Banbury, will do the work of the second and third mixer plus manually operated mills.

When you eliminate as unnecessary, therefore, certain basic machines such as internal mixers and mills from present-day compounding systems, you have no need of the associated equipment, that is, pelletizers, conveyors, selective storage facilities, and other parts of these systems. Floor areas now occupied by these basic machines and related equipment, together with the extra material in process that is required when they are used, are no longer necessary. Reduction in the amount of material in process in a given plant means a reduction in working capital requirements; and, finally, a considerable amount of the labor that is used in subsequent compounding and in the operation of the extra mixers and mills is no longer needed.

Why must a man be required to operate a mill, and why should a mill operate at loafing speeds? We have proved that the rubber stocks of today will not reach dangerous temperatures with roll speeds more than double what they are now. In fact, the mill-roll speed is now geared to the man and not to stock throughput nor its temperature limitations.

During the past few years, rotor speeds and pressures inside the Banbury mixer have been increased to two or three times their former levels, and we have yet to hear that the temperatures developed in the rubber stocks being mixed under these conditions are prohibitive.

Also, the "Rotomill"[4] and other screw-type continuous mixers would not have to be used for final mixing and plasticizing operations, but instead could be used for preliminary blending operations, when followed by automatic mills in a continuous system, as will be shown later. It has been our experience that heat build-up of stocks is a problem when screw-type mixers are used at high production rates. The mechanized open mill can prepare the final mix in large quantities and keep stock temperatures low so that its use with screw-type machines has much promise.

Working large banks of stock between the rolls of the two-roll mill is a common sight in a mill room today. If we are to obtain the constant plasticity required for uniform weights of extruded or calendered stock desired, the excess stock in these mill banks should be reduced, and every portion of the stock thoroughly and continuously treated to the same degree during milling. The two-roll mill has outstanding ability to plasticize all portions of a batch of rubber to the same degree if operated under proper conditions.

In the development of the high-speed automatic

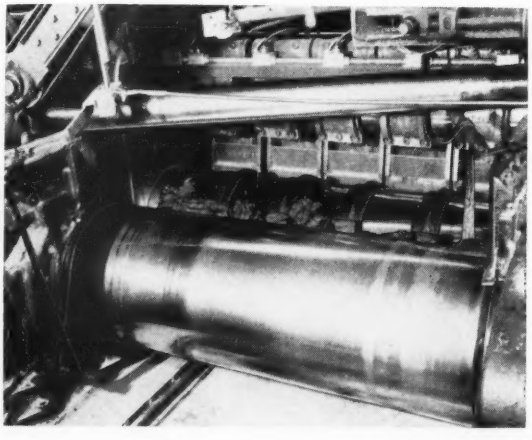

Fig. 2. View from top of 26- by 84-inch mill showing bank, strips of uncurled stock between curling wheels, and strip of stock being recirculated to bank

[3]The mechanism permitting high-speed and automatic two-roll mill operations is covered by patents granted and pending in the United States and most foreign countries and assigned to Blaw-Knox Co.

[4]A. E. Juve, J. R. Beatty, R. H. Kline, "Proceedings of the International Rubber Conference, Washington, D. C., Nov., 1959," p. 1. Available from Mr. Geo. E. Popp, Treas., Division of Rubber Chemistry, ACS, c/o Phillips Chemical Co., 318 Water St., Akron, O.

## New Rubber Processing Techniques for the Sixties

The author of this paper, who in 1941 predicted "The Mill Room of the Future," feels that present-day high labor costs, the large increases in capital funds required for machinery and equipment, and the greater emphasis on product quality make necessary certain changes in rubber processing departments or mill rooms in order to improve the economics of these operations.

The two-roll mill can be made automatic with greatly increased performance capabilities for plasticizing and mixing rubber stocks by the addition of certain special equipment, and it could be operated at higher-than-normal speeds.

Using these automatic mills, new techniques for the "Mill Room of the Sixties" have been developed. With the "one-shot" or the "continuous" system the stock is automatically handled, plasticized, and mixed to a predetermined degree for uniform extruding and calendering without being touched by hand from the time the raw materials are taken from the receiving room until the stock reaches its final form from the extruder or calender.

With the "one-shot" system, the intermediate pelletizing handling system, storage and the second or final mix Banbury with sheeting mill could be eliminated. With the "continuous" process both internal mixers would be unnecessary.

By means of the new techniques described, it should be possible to build a mill room producing a finer quality product with a capital outlay much less than in preinflation days and with a large reduction in the amount of labor required to operate the equipment used.

mill for the continuous preparation or warm-up of stock for further processing, the essential features involved in such a mill are means of feeding mixed stock continuously to the mill and a series of power-driven curling wheels mounted adjacent to the high-speed mill roll, as explained below. A pair of adjustable slitting knives that are used to cut the correct width of strip for conveyance to an extruder or calender and an automatic take-off device at the discharge end of the roll to convey the strip to the extruder or calender also are involved.

Figure 1 shows the power-driven curling wheels and cutting knives attached to a 26- by 84-inch two-roll mill. The curled cut strips are advanced from the feed-in end to automatic discharge. Figure 2 is a view of the entire bank from the feed-in end to automatic discharge.

Figure 3 illustrates the action of the power-driven curling wheel rotating adjacent to a high-speed mill roll in forming the curl of stock and how this curl advances into the mill bank. The detailed section E-E of the curling wheel in operation in Figure 3 shows that the curling wheel has a shallow cone face and that the wheel is tilted to bring one side of the face in close parallelism with the work roll. This side of the curling wheel is moving in opposite direction to that of the adjacent mill roll, and with the clearance between the wheel and the roll less than the stock thickness the sheet of stock will curl on itself and then travel around to the V-shaped pocket formed between the other side of the curling wheel face and the mill roll surface. The face of the curling wheel never touches the mill roll surface. After the curl is completed it advances into the mill bank and here the curls roll endwise, resulting in double directional rotation and intensive working.

The above paragraph explains how the stock advances from one end of the roll to the other and how it is blended during its travel. The squeezing which takes place between the mill rolls forces approximately half of each curl forward to join the preceding one, while the other half is retarded and becomes integrated with the following curl.

After leaving the last curling wheel the stock passes

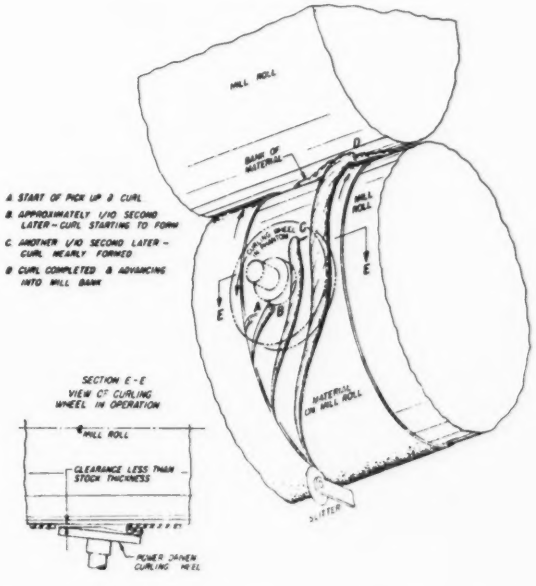
A START OF PICK UP & CURL
B APPROXIMATELY 1/10 SECOND LATER – CURL STARTING TO FORM
C ANOTHER 1/10 SECOND LATER – CURL NEARLY FORMED
D CURL COMPLETED & ADVANCING INTO MILL BANK
MILL ROLL
BANK OF MATERIAL
MILL ROLL
MATERIAL ON MILL ROLL
SECTION E-E VIEW OF CURLING WHEEL IN OPERATION
MILL ROLL
CLEARANCE LESS THAN STOCK THICKNESS
POWER DRIVEN CURLING WHEEL

Fig. 3. Action of power-driven curling wheel rotating adjacent to high-speed mill roll. Section E-E shows some details of the shape, the mounting, and the operation of the curling wheel

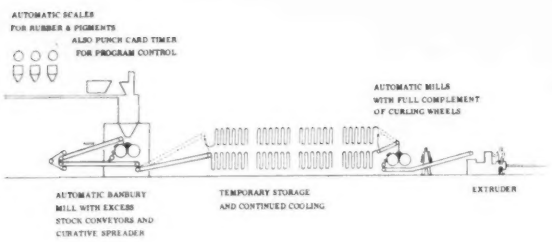


**Fig. 4. The "one-shot" mixing and control system for the "Mill Room of the Sixties"**

to the take-off end of the mill where adjustable slitting knives control the width of the ribbon to be conveyed to the next or subsequent operation. The take-off consists of a power-driven scraper knife which is remotely or automatically operated.

It is essential that the bank between the rolls be kept at a low but active level, which means that mills will some day have larger rolls to accommodate batches from internal mixers. Today's mills can be adequately equipped with aprons and conveyor systems as will be shown later.

## Mill Rooms of the Sixties

### Batch System

A large percentage of present-day rubber stocks requires masterbatching in an internal mixer. With the use of high-speed automatic mills a "one-shot mixing" system would eliminate the need of a second internal mixer and a pelletizing system with its selective storage bins, etc.

With the "one-shot mixing" system, the masterbatch is first prepared in the internal mixer, as shown in Figure 4, then dropped or conveyed from the mixer to a high-speed automatic mill which has replaced the slow and manually operated sheeting mill beneath the mixer. The high-speed automatic mill with large and closely set rolls quickly reduces the masterbatch to a thin sheet for low-temperature milling.

For the present, existing mills with conventional sized rolls can be expanded in capacity by providing a circulating belt extending to the rear of the mill, as shown in Figure 5, as an alternate to the high-speed mill with large rolls. Please note the various factors involved in the conventional mill-circulating belt combination and how they are involved in the completion of the entire mix. The bank of stock between the mill rolls is smaller because about half of the batch is on the circulating conveyor. The mixing and blending is aided by slitting the wide ribbon on the conveyor into two halves and delivering each half to opposite ends of the bank. Curling wheels advance the banks at the end toward the middle where the wide ribbon is again removed from the mill roll and returned to the conveyor. After several such passes the curatives can be added, and the mixing carried to completion. An automatic take-off then removes the wide ribbon from the mill and deposits it on a cooling conveyor.

Processing up to this point has been accomplished by automatic weighing of the rubber and most of the compounding ingredients, masterbatching in the internal mixer, and then addition of the curatives to the entire masterbatch while automatically mixing and blending the stock to a uniform dispersion standard on the high-speed automatic mill.

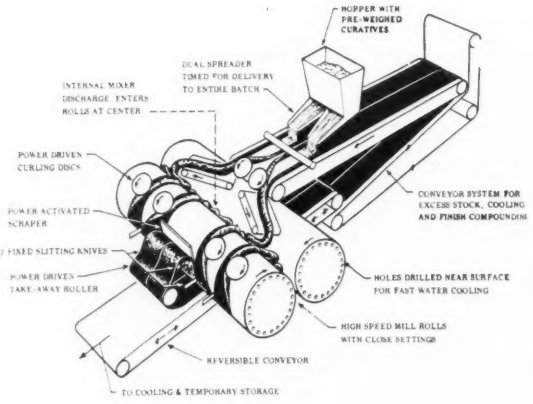


**Fig. 5. Automatic mill and mill conveyor for handling the stock from the masterbatch Banbury**

The stock now passes through a cooler, and we have chosen a festoon device which lends itself at present to automatic feeding, cooling, and discharge after storage. See Figure 4. There may be better or even cheaper arrangements developed at some later date, but we know this one to be practical and successful. Besides being a cooler, such a device can be rightfully termed a"surge" storage unit.

After storage and cooling, the stock is conveyed directly to a continuous-type automatic mill with its full complement of curling wheels. This mill can have a variable-speed drive and is synchronized with the rpm. of the extruder or calender by the operator. An automatic stock remover is also part of the equipment on this mill, and the strip width can be regulated to suit the die or tread size.

This predicted "Mill Room of the Sixties" is in sharp contrast to the "Mill Room of the Fifties," as may be seen from Figure 6. The masterbatch pelletizer would be replaced by an automatic batch-type mill; masterbatch pellet storage would be eliminated; the second internal mixer for final mix of curatives into the finished stock would be unnecessary; and hand stacking and trucking also would be unnecessary. Obviously, a very significant amount of capital investment and labor would be eliminated. In addition, fewer operations mean fewer human errors and greater control over product quality and uniformity.

### Continuous System

As an alternate to batch mixing, handling, etc., we have conducted extensive pilot-plant operations with small or so-called incremental batches which are

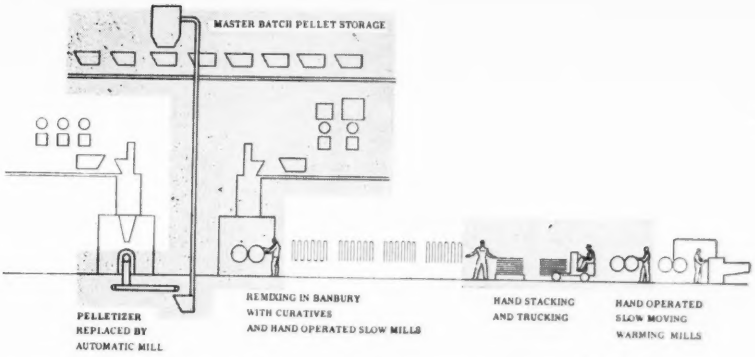
MASTER BATCH PELLET STORAGE
PELLETIZER REPLACED BY AUTOMATIC MILL
REMIXING IN BANBURY WITH CURATIVES AND HAND OPERATED SLOW MILLS
HAND STACKING AND TRUCKING
HAND OPERATED SLOW MOVING WARMING MILLS

Fig. 6. The "Mill Room of the Fifties." Shaded areas show equipment eliminated by use of "one-shot" mixing system to achieve "Mill Room of the Sixties"

in effect, a continuous weighing and mixing operation.

The total requirements of rubber, filler, curatives, etc., for a given stock are delivered to a screw-type blending machine in 10- or 15-pound batches at short intervals. The weight of the component parts of these small batches is predetermined and the scales set to dump these amounts automatically at about three-second intervals. A conveyor moves these spaced incremental batches to the "Rotomill" or other specially designed continuous mixer for preliminary blending. (See Figure 7.)

This type of system replaces the larger automatic proportioning scales and the internal mixer. The extruder-feeder roughly masses and squeezes the rubber and compounding ingredients together and then discharges on to the automatic mill which reduces the stock to the desired plasticity and finalizes the dispersion of the compounding ingredients. As previously mentioned, the use of the latex masterbatches, such as the SBR 1600, 1700, and 1800 types, would add to the attractiveness of such a system since some of the compounding ingredients would already be in the rubber used.

A festooning system would allow the completely compounded and mixed stock to cool to room temperature, after which it could be fed to a second automatic mill for preparation for immediate extrusion or calendering. With this continuous compounding technique, material would be carried in inventory either in raw form or finished condition, and there would be a comparatively small amount in process.

We consider the continuous compounding technique the most economical of all types, and it certainly represents the lowest in capital investment required. We present it with considerable optimism as the one system having the greatest possibility for future savings. The elimination of large compounding and mixing installations would justify the use of a larger number of these small and complete units.

## Summary and Conclusions

The two-roll mill can be converted into an automatic mill with vastly increased performance capabilities for plasticizing and mixing rubber stocks by the addition of certain special equipment. By means of special cutting knives, power-driven curling wheels, and appropriate feed and take-off equipment, the two-roll mill becomes automatic in operation and could

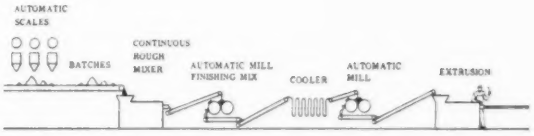


Fig. 7. The "continuous" mixing system for the "Mill Room of the Sixties" with extruder feeder

be operated at substantially higher than normal speeds with essentially no stock temperature build-up.

Using these automatic mills, new techniques for the "Mill Room of the Sixties" have been developed. With either the "one-shot" or "continuous" mixing process the stock is automatically handled and plasticized to a predetermined degree for even and uniform extruding and calendering. With either method the stock is not touched by hand from the time the raw material is taken from the receiving room until it reaches its final form from an extruder or calender.

With the "one-shot" process the intermediate pelletizing handling system and storage and the second or final mix Banbury with its sheeting mill could be eliminated. With the "continuous" process both internal mixers would be unnecessary.

By means of the new techniques described, it should be possible to build a mill room producing a finer quality of product with a capital outlay much less than required in pre-inflation days. Several mill room attendants would replace the more expensive labor required to operate the mills and other equipment used with the older systems.

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## Multi-Colored Highways Predicted

Synthetic thermo plastics have been compounded to give satisfactory highway surfaces which can be colored by the use of selected pigments for a wide range of applications for increased safety, performance, and eye appeal. Possible uses include airport runways to show proper landing areas and in cloverleafs or other highway interchanges to show correct routes and to control speed: stop or danger areas in red, for example, or the use of yellow (caution) for merging traffic lanes. Test installations have been made on the grounds of Esso Research & Engineering Co., Linden, N. J.

# Storage Stability of Tread Rubber And Tire Repair Materials

By R. D. JUVE and F. M. JOHNSON
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## Storage Stability of Tread Rubber and Tire Repair Materials

In an effort to develop an accelerated test for determining the probable shelf life of unvulcanized tread rubber and tire repair materials, a wide variety of commercial compounds was aged at room temperature and at 100, 125, 150, and 200° F. in an air oven, and plasticity changes and effect on 300% modulus after curing were determined.

Prevulcanization, deactivation of curing rate, and stiffening were found to occur simultaneously during aging at temperatures up to 150° F. At 200° F., prevulcanization was so rapid that trends toward deactivation of the curing system were obscured. The temperature dependence of the reactions appeared to vary widely for different stocks. Experimental evidence was found to indicate that the deterioration of cure rate was associated with accelerator disappearance or deactivation.

An increased rate of stiffening was observed when specimens were aged under mild pressure to simulate the pressure at the base of a roll of tread rubber during storage.

The results of the work reported in this paper indicate that the maximum aging temperature at which reasonable estimations of probable shelf life can be determined is in the vicinity of 150° F., but definitely below 200° F. Results at 125° F. appeared to be somewhat more reliable than those obtained at 150° F., but a longer aging period was required.

Federal Specifications ZZ-T-416a and ECO 35170-4 require that tread rubber and repair materials be satisfactory for their intended use for 12 months, provided the storage temperature has not exceeded 110° F. Although none of the samples tested failed after 12 months at 72-83° F., the results at 100° F. indicate the possibility that some of the samples probably would have failed at 90° F. within 12 months by prevulcanization, and that many would have suffered severe loss in curing activity.

TREAD rubber and repair materials used in retreading and repairing tires are frequently in storage for long periods of time before being vulcanized. Tread rubber and repair materials purchased by U. S. Army Ordnance Corps are required to be satisfactory for their intended use for 12 months, provided the maximum ambient temperature has not exceeded 110° F., and the average ambient temperature has not exceeded 90° F. Similar storage stability is expected in commercial use.

In order to be able to predict the relative degree of storage stability of these materials, industrial laboratories have developed various accelerated testing conditions for them. Fairly good correlation between accelerated aging and actual service results has been found when the composition of the rubber compound is known. For example, when practice had shown that a certain tread rubber or repair material compound aged satisfactorily in service, some particular test might provide reliable predictions of expected service life as influenced by the heat history of different batches in factory processing. Changes in type of accelerator, type of carbon black, or other critical ingredients used in such compounds have yielded misleading results, however, when the same set of accelerated aging conditions were applied.

The development of a method for predicting with reasonable accuracy the shelf life of unvulcanized compounds of unknown composition is desirable for the Ordnance Corps, to be certain that minimum shelf-life requirements are met, and is the purpose of this paper.

The published literature contains scant information regarding the long-time storage of unvulcanized rubber compounds. Schroeder[1] has pointed out that the storage stability of unvulcanized natural and synthetic rubber stocks is affected by the type of accelerators, type of retarders, type of polymers, the heat history, and the effect of the reaction between the polymer and the loading pigment. Moakes and Soden[2] reported that natural rubber tread compounds showed no serious deterioration and only slight changes in tensile strength and resistance to abrasion and flex cracking after 48 months' aging at 50 to 59° F.

## Experimental Details

In an effort to develop an accelerated test for determining the probable shelf life of unvulcanized tread

[1] India RUBBER WORLD, 125, 53 (1951).
[2] *Rubber Chem. Tech.*, 21, 860 (1948).

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Robert D. Juve received his B.S.Ch.E. degree from Purdue University in 1939, and from 1939 until 1950 was employed by the Goodyear Tire & Rubber Co. in Akron, O., in the field of synthetic rubber research.

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rubber and tire repair materials of unknown composition in accordance with the desire of the Ordnance Corps, exposure of a wide variety of such compounds to temperatures of 80, 100, 125, 150, and 200° F., in air ovens and measurement of changes in plasticity and 300% modulus were studied.

In order to obtain a fairly broad coverage of the effects of variations in compounding, heat history, and other factors as currently employed in commercial practice, a relatively large number of a variety of types of repair and retreading materials was procured. Since these were commercial products from numerous manufacturers, the specific composition of the stocks and their heat histories were unknown, but all samples were believed to have been reasonably fresh at the start of test program.

Although compositions were unknown, some indication of the variations between types may be seen from approximate optimum curing times which were as follows: Tread stocks, 45-60 minutes at 280° F.; tread repair gums, 40 minutes at 280° F.; padding stocks (those used to build up low spots on buffed tires), 45 minutes at 260° F.; repair cushions (used to cover exposed cords, etc. on buffed tires), 35 minutes at 260° F.; all-purpose gums (softer and more pliable stock for general repair work), 20 minutes at 280° F.; and quick-cure tube gums, 20 minutes at 260° F.

Plasticity changes were studied mostly by means of the Williams plasticity test ASTM D 926-56,[3] with the Mooney viscosity, ASTM D 927-57T,[3] used in a few instances.

The Williams plasticity test was run according to the ASTM method except that the sample was not preheated for 15 minutes at the test temperature. Owing to the fast-curing nature of the tube gums and the all-purpose gums the Williams plasticity test was run for three minutes at 158° F.; whereas all other materials were tested for 10 minutes at 212° F. All materials used, except tread rubber, were not masticated or milled for plasticity or modulus tests. Thin materials were carefully plied to the correct gage. Although the preheating was eliminated, it was felt that no misleading information resulted from this omission.

For samples that tended to precure uniformly throughout the section, the Mooney viscosity and the Williams plasticity tests yielded rather parallel results in depicting the stiffening trends. Some tread rubber stocks, however, have a tendency to precure in a center stratum before the outer portions started to cure because of the relatively slower heat dissipation from the center during manufacture. For both Mooney and Williams tests, specimens were cored through a section of stock so that the specimens contained precured as well as uncured strata if the stock had started to precure in the center during the aging test.

For samples containing a precured portion, the Mooney results were misleading; whereas the Williams plasticities reflected the partially vulcanized condition. For this reason, the Williams plasticity test was favored for most of this program. The data shown in Tables 1, 3, 4, 5, 6, and 7 as "Rise in Williams Plasticity Values" are the increases in the plasticity values between the original unaged tests and the tests after the aging periods cited. The larger the rise in the values reported, the more the change or decrease in actual plasticity. No change in plasticity during aging would be represented by a figure of 0.0 mm.

All samples were cut and plied to the desired size before oven aging. For the preparation of tread rubber tensile specimens, milling was employed to obtain slabs of 0.090-inch in gage. All samples were then covered with polyethylene film and stitched to exclude air from the surface of the samples. For 200° F., oven aging, cellophane was used in place of polyethylene film.

The pressure of 4.17 psi. is roughly equivalent to the pressure at the base of a roll of tread rubber as it would stand during storage. In order to simulate this condition

[3] American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

TABLE 1. TREAD RUBBER PLASTICITY CHANGES

| Sample | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rise in Williams Plasticity Values (Mm.) | | | | | | | | | | | | |
| Aged at | | | | | | | | | | | | | |
| 72-83° F. for 600 days | 0.12 | 0.40 | 1.01 | 0.26 | 0.29 | 0.66 | 0.63 | 0.77 | 0.40 | 0.31 | 1.76 | 0.06 | 0.54 |
| 100° F, 570 days | 0.74 | 0.79 | 2.23 | 2.60 | 1.12 | 1.63 | 1.62 | 1.90 | 1.28 | 1.73 | *2.16 | 1.05 | 0.97 |
| 125° F., 42 days | 0.42 | 0.52 | 1.47 | 1.37 | 0.49 | 0.84 | 1.08 | 0.81 | 0.37 | 0.56 | 4.22 | 0.50 | 0.98 |
| 150° F., 12 days | 0.75 | 0.44 | 2.87 | 2.21 | 1.05 | 2.39 | 3.98 | 1.69 | 3.01 | 1.33 | †3.72 | 3.78 | 1.66 |
| 200° F., 12 hours | 0.71 | 0.57 | 3.44 | 4.27 | 1.79 | 3.95 | 8.68 | 2.94 | 3.17 | 1.51 | 4.69 | 4.52 | 3.79 |

* At 120 days.
† At 6 days.

TABLE 2. EFFECT OF MILD PRESSURE UPON TREAD RUBBER PLASTICITY CHANGES DURING AGING

| Sample | A | B | C | D | F | G | K | L |
|---|---|---|---|---|---|---|---|---|
| | Mooney Viscosity MS 1 + 4 (250° F.) | | | | | | | |
| Original | 23 | 27 | 24.5 | 28 | 23 | 20 | 29 | 21 |
| Aged at 150° F. for 8 days: no pressure | 27.5 | 31 | 44.5 | 48.5 | 41.5 | 39 | >150* | 36 |
| Under 4.17 psi. | 32.5 | 39 | 68 | 82 | 80 | 93 | >150* | 57 |

* Precured as indicated by pencil indentation test.

a pressure apparatus was devised consisting of a cylindrical tube nine inches long with an inside diameter of 1.75 inches. The tube screwed into a flat base plate at one end and a free-moving piston fitted inside the tube at the top end. The piston supported a plate which could hold various weights. Mooney samples were died out 1.75 inches in diameter, covered with polyethylene and placed in the tube. A total of 10 pounds (4.17 psi. exerted on the samples) was placed on the cylinder, and the apparatus with samples was placed into the oven at the desired test temperature. After aging, the samples were removed and submitted to Mooney viscosity tests.

## Plasticity Changes during Aging—Tread Rubber

The commercial samples of tread rubber from 13 different manufacturers all contained some type of SBR as the base polymer. Probably some also contained some reclaimed rubber.

By rating the stocks according to their decreases in plasticity (rise in Williams plasticity values in Table 1), fairly good correlation was found between the relative rankings at 125° F., and the relative rankings at room temperature and at 100° F., when the stocks with least change were grouped as good, and those with most change were grouped as poor. Although some anomalies are apparent, these data are presented for general information.

Aging at 150° F. showed somewhat less correlation of the relative plasticity stability rankings than did the aging at 125° F., in comparison to relative rankings after aging at room temperature and at 100° F. Stock K precured most rapidly at 150° F., as well as at the lower temperatures. Stocks A and B changed the least in plasticity at 150° F. and were similarly among the best at the lower test temperature. Stock L, however, precured rapidly at 150° F.; whereas it was one of the most stable stocks at room temperature, 100° F., and 125° F., when judged by the plasticity changes after the specific aging conditions shown on Table 1.

A temperature of 200° F. appears to be too high to predict the storage stability of tread rubber.

The data in Table 2 illustrate the influence of pressure on the tendency to stiffen. Aging for eight days at 150° F. showed pressure aging to result in markedly greater increases in viscosity than aging without pressure.

## Plasticity Changes during Aging—Repair Materials

Many of the tire repair materials in this study appeared to contain natural rubber as the only polymer. Others probably contained some SBR or reclaimed rubber in addition to the natural rubber. Data showing the effect of aging on the plasticity of the various repair materials are shown in Tables 3 through 7.

Most of the repair materials were satisfactorily stable in plasticity during storage despite their fast-curing characteristics. In general, accelerated aging at 125° F. tended to show relative plasticity changes rather parallel to those obtained at room temperature and at 100° F. The relative ratings of the stocks were judged according to the degree of decrease in plasticity (rise in Williams plasticity value) after aging at the various temperatures.

Although some of the results are contradictory, the data are presented to show the general nature of the plasticity changes that result from aging at different temperatures. These results are descriptive of the difficulties

TABLE 3. TREAD REPAIR GUM PLASTICITY CHANGES

| Sample | SA | SB | SC | SD | SE | SF | SG |
|---|---|---|---|---|---|---|---|
| | Rise in Williams Plasticity Values (Mm.) | | | | | | |
| Aged at | | | | | | | |
| 72-83° F. for | | | | | | | |
| 360 days | .80 | .07 | .32 | .10 | .44 | .34 | .32 |
| 420 days | .74 | .07 | .37 | .17 | .48 | .40 | .37 |
| 100° F., 360 days | .76 | .29 | .51 | .44 | .89 | 1.15 | .37 |
| 125° F., 42 days | .42 | .08 | .42 | .28 | .61 | .61 | .38 |
| 150° F., 12 days | 1.19 | .07 | .97 | .69 | .37 | 1.16 | 1.30 |
| 200° F., 12 hours | * | 1.69 | .66 | 1.15 | 3.99 | 1.92 | * |

* Insufficient stock for test.

TABLE 4. PADDING STOCK PLASTICITY CHANGES

| Sample | PB | PC | PD | PE | PF |
|---|---|---|---|---|---|
| | Rise in Williams Plasticity Values (Mm.) | | | | |
| Aged at | | | | | |
| 72-83° F. for 360 days | .09 | .10 | .28 | .15 | .17 |
| 100° F., 360 days | .53 | .71 | 1.38 | 1.87 | 3.97 |
| 125° F., 42 days | .15 | .28 | .55 | 1.20 | 1.73 |
| 150° F., 15 days | .21 | 1.00 | 7.88 | 5.34 | 5.12 |
| 200° F., 7 hours | .16 | .12 | 3.92 | .31 | 7.82 |
| 11 hours | .29 | .18 | 8.47 | 1.11 | 7.10 |

TABLE 5. REPAIR CUSHION STOCK PLASTICITY CHANGES

| Sample | CA | CB | CC | CD | CE | CF | CG | CH |
|---|---|---|---|---|---|---|---|---|
| | Rise in Williams Plasticity Values (Mm.) | | | | | | | |
| Aged at | | | | | | | | |
| 72-83° F. for 360 days | −.07 | .08 | .32 | −.14 | .09 | .08 | .05 | −.06 |
| 480 days | .05 | .17 | .39 | −.12 | .14 | .08 | .12 | .09 |
| 100° F., 360 days | .09 | .25 | 1.23 | −.09 | .09 | .22 | .16 | .17 |
| 480 days | .48 | .30 | 3.08 | −.06 | .25 | .38 | .40 | .27 |
| 125° F., 42 days | .09 | .27 | .79 | .01 | .13 | .29 | .09 | .22 |
| 150° F., 13 days | .46 | .18 | 6.46 | .46 | .12 | .54 | .15 | .14 |
| 200° F., 10 hours | .97 | .01 | 5.51 | 4.13 | .12 | .37 | .65 | .03 |

TABLE 6. ALL-PURPOSE GUM PLASTICITY CHANGES

| Sample | AA | AB | AC | AD | AE | AF |
|---|---|---|---|---|---|---|
| | Rise in Williams Plasticity Values (Mm.) | | | | | |
| Aged at | | | | | | |
| 72-83° F. for 360 days | .16 | .60 | .55 | .26 | .21 | .36 |
| 420 days | .13 | .63 | .63 | .27 | .24 | .38 |
| 100° F., 360 days | .69 | .74 | 2.51 | 67 | .49 | .47 |
| 125° F., 42 days | .59 | .45 | 1.15 | .41 | .19 | .56 |
| 150° F., 12 days | .94 | 2.20 | 2.32 | 1.11 | .89 | 1.69 |
| 200° F., 7 hours | 7.27 | .51 | 2.21 | .11 | .11 | 4.31 |

TABLE 7. QUICK-CURE TUBE GUM PLASTICITY CHANGES

| Sample | TA | TB | TC | TD | TE | TF |
|---|---|---|---|---|---|---|
| | Rise in Williams Plasticity Values (Mm.) | | | | | |
| Aged at | | | | | | |
| 72-83° F. for 420 days | 1.54 | −.04 | .17 | 1.17 | .44 | .74 |
| 100° F., 270 days | *1.66 | .31 | 1.21 | 1.87 | *3.57 | *1.55 |
| 125° F., 21 days | 1.26 | .19 | .35 | 1.03 | .53 | .71 |

* Vulcanizate was curled, indicating precure.

in establishing reliable accelerated aging test conditions. Generally, the higher above service storage temperatures that the tests are run, the faster the rate of precure, but the temperature coefficient does not appear to be constant for all stocks.

The time of aging varied because of the different dates at which the groups of samples were received. Data for the 80 and 100° F. aging are presented for the maximum lengths of time that the tests were run. At 150 and 200° F., data are not available at the same periods of exposure because of expediency in the testing program.

## Effect of Aging on Curing Activity of Tread Rubbers

In addition to loss of plasticity and precuring during storage, deactivation of the curing system also occurred. This deactivation was evident to some degree in all tread rubbers and repair materials. Any sample of tread rubber that exhibited poor storage stability at room temperature, as judged by loss of modulus of the vulcanizate, also aged poorly at 100, 125, and 150° F. (See Table 8.) The rate at which the first approximately 20 or 25 % loss in modulus occurs is the most critical from a practical standpoint because it is indicative of the range in which problems will occur during retread vulcanization if the vulcanization rate falls below that required. Because of the relatively rapid rate of precuring at 200° F., the studies of the loss in curing effect gave irregular results, and no conclusions could be drawn. It was found, however, that those samples which aged poorly, as measured by residual modulus, generally were less prone to precure.

The effect of aging on the curing activity is shown in Table 8. When vulcanized after 600 days' aging at room temperature, the tread rubbers showed residual modulus ranging from 45 to 92% of the values obtained on the original unaged samples. After 570 days at 100°

TABLE 8. EFFECT OF SHELF AND OVEN AGING ON THE 300% MODULUS OF COMMERCIAL TREAD RUBBERS

(Vulcanized 45 Minutes at 280° F.)

| Sample | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unaged 300% modulus, psi. | 960 | 1120 | 1100 | 1065 | 1030 | 1205 | 1185 | 810 | 825 | 970 | 1110 | 940 | 1195 |
| | % Residual Modulus | | | | | | | | | | | | |
| Aged at 72-83° F. for | | | | | | | | | | | | | |
| 360 days | 97.4 | 97.6 | 86.4 | 105 | 83.5 | 89.6 | 81.4 | 88.9 | 76.4 | 81.4 | 103 | 71.4 | 68.7 |
| 600 days | 68.2 | 68.6 | 70.0 | 84.5 | 65.5 | 68.4 | 67.5 | 57.4 | 56.7 | 60.9 | 92.5 | 52.2 | 45.2 |
| Aged at 100° F. for | | | | | | | | | | | | | |
| 120 days | 73.4 | 80.2 | 77.7 | 87.4 | 71.3 | 72.6 | 81.0 | 71.0 | 67.9 | 79.4 | 98.3 | 69.1 | 62.8 |
| 360 days | 73.5 | 74.0 | 64.5 | 78.5 | 56.8 | 64.3 | 53.1 | 53.1 | 45.4 | 59.8 | SU | 41.5 | 31.8 |
| 570 days | 57.4 | 52.2 | 48.6 | 56.4 | 40.3 | 36.5 | 43.8 | 33.3 | 35.8 | 45.9 | SU | 29.2 | 15.0 |
| Aged at 125° F. for | | | | | | | | | | | | | |
| 21 days | 68.2 | 72.3 | 75.0 | 86.8 | 78.0 | 82.0 | 79.7 | 67.3 | 65.5 | 71.2 | *95.5 | 67.5 | 71.1 |
| 42 days | 68.0 | 72.0 | 67.0 | 77.0 | 66.5 | 66.0 | 64.0 | 66.0 | 51.0 | 55.0 | *91.0 | 64.4 | 55.6 |
| Aged at 150° F., 12 days | 71.5 | 71.6 | 68.0 | 88.2 | 71.9 | 77.7 | 87.9 | 75.3 | 73.0 | 98.4 | *94.5 | 74.9 | 60.1 |

SU. Set up.
* Vulcanizate was curled indicating partially set up.

TABLE 9. EFFECT OF 100° F. OVEN AGING ON MODULUS AND TENSILE STRENGTH OF TREAD RUBBER SAMPLE M

Vulcanized 45 Minutes at 280° F.

| Aged @ 100° F. | 300% Modulus, psi. | Tensile, psi. |
|---|---|---|
| Unaged | 1195 | 2590 |
| 30 days | 1035 | 2510 |
| 60 days | 845 | 2370 |
| 90 days | 850 | 2260 |
| 150 days | 660 | 2030 |
| 270 days | 470 | 1605 |
| 300 days | 530 | 1840 |
| 450 days | 285 | 970 |
| 570 days | 180 | 465 |

TABLE 10. EFFECT OF 125° F. OVEN AGING ON THE 300% MODULUS OF COMMERCIAL TREAD RUBBERS (AVERAGE)

| | Cure—Min./°F. | | |
|---|---|---|---|
| Avg. % Residual Modulus | 30/280 | 45/280 | 60/280 |
| Aged at 125° F. for | | | |
| 7 days | 75.4 | 83.1 | 88.1 |
| 14 days | 67.4 | 79.8 | 85.7 |
| 21 days | 61.7 | 74.7 | 81.3 |
| 28 days | 56.2 | 71.8 | 77.8 |
| 35 days | 55.7 | 64.4 | 74.7 |
| 42 days | 51.7 | 65.2 | 74.9 |

F., the range ran from 15 to 57% excluding one precured sample. Sample K showed the best retention of curing activity, followed by Sample D. Reference to Table 1, however, shows Sample K tended to set up more rapidly than the other samples, and Sample D showed severe stiffening. Further comparison of Table 1 and Table 8 shows erratic correlation, but the need is pointed out of evaluating both of these aspects of storage stability. As the aging temperature increased, the tendency to precure obscured the relative ratings of the stocks as to their retention of curing activity.

In an effort to determine the cause of this deactivation of the curing system, two laboratory batches were mixed on a laboratory mill. The batches were identical except that the accelerator was left out of one batch. The two batches were then aged for 10 days at 150° F. After aging, both stocks were remilled, and the accelerator was added to the batch from which it originally had been omitted. Stress-strain data showed that the standard-mixed batch retained only 57% of its original modulus at the 45-minute cure at 280° F.; whereas the batch with the accelerator added after aging had 90% of the modulus of the original batch.

Although no positive explanation for the deactivation of the curing system is known, it seems most likely to be due to a reaction of accelerator with carbon black or some other ingredient in the stocks. The adsorption of accelerators by carbon black has been discussed by Studebaker.[1] The samples from each stock were stacked during the aging so that physical loss would have had to be through a large bulk of material. There was no evidence, furthermore, of bloom from sulfur or accelerator on the polyethylene film.

As a result of this deactivation of the curing system, both tensile strength and hardness (not shown) were affected as well as the modulus. As the modulus fell off, the tensile strength decreased, but at a different rate. For example, tread rubber Sample M had an original modulus of 1195 psi. and a tensile strength of 2590 psi. at the 45 min./280° F. cure. Table 9 shows the data.

The deactivation of the curing system was more evident in the shorter cure times than in the longer cure times. Table 10 illustrates this point. Although there were a few minor discrepancies, the average of the 13 commercial tread rubber samples showed that the 60-minute cures had greater residual modulus than the

[1] *Rubber Chem. Tech.*, 30, 1464 (1957).

TABLE 11. EFFECT OF SHELF AND OVEN AGING ON THE 300% MODULUS OF COMMERCIAL SHEET TREAD GUMS

(Vulcanized 40 Minutes at 280° F.)

| Sample | SA | SB | SC | SD | SE | SF | SG |
|---|---|---|---|---|---|---|---|
| Unaged 300% modulus, psi. | 1010 | 830 | 1125 | 975 | 975 | 1300 | 1240 |
| | % Residual Modulus | | | | | | |
| Aged at 72-83° F. for | | | | | | | |
| 240 days | 86.1 | 85.5 | 101 | 111 | 90.3 | 106 | 102 |
| 420 days | 84.3 | 81.1 | 91.4 | 101 | 80.2 | 93.7 | 98.8 |
| Aged at 100° F. for | | | | | | | |
| 120 days | 32.7 | 69.3 | 86.7 | 107 | 72.9 | 103 | 102 |
| 240 days | 12.8 | 46.3 | 69.5 | 87.4 | 51.0 | 83.4 | 83.3 |
| 360 days | NC | 44.1 | 63.4 | 78.6 | 47.2 | 79.9 | 81.5 |
| Aged at 125° F. for | | | | | | | |
| 21 days | 72.3 | 63.9 | 87.5 | 89.3 | 72.3 | 86.5 | 91.4 |
| 42 days | 34.1 | 65.0 | 87.1 | 96.4 | 74.4 | 98.5 | 111 |
| Aged at 150° F., 12 days | 27.3 | 59.2 | 71.5 | 78.5 | 64.5 | 89.2 | 75.3 |

NC. No cure.

TABLE 12. EFFECT OF SHELF AND OVEN AGING ON THE 300% MODULUS OF COMMERCIAL PADDING STOCKS

(Vulcanized 45 Minutes at 260° F.)

| Sample | PB | PC | PD | PE | PF |
|---|---|---|---|---|---|
| Unaged 300% modulus, psi. | 350 | 610 | 980 | 375 | 400 |
| | % Residual Modulus | | | | |
| Aged at 72-83° F. for | | | | | |
| 240 days | 103 | 89.1 | 91.1 | 100 | 98.7 |
| 360 days | 96.5 | 75.2 | 78.5 | 102 | 96.4 |
| Aged at 100° F. for | | | | | |
| 120 days | 74.3 | 77.0 | 67.9 | 93.4 | 106 |
| 240 days | 49.3 | 40.8 | 50.5 | 68.2 | 104 |
| 360 days | 41.0 | 32.0 | 42.7 | 52.0 | 100 |
| Aged at 125° F. for | | | | | |
| 21 days | 98.6 | 99.2 | 88.8 | 107 | 125 |
| 42 days | 74.4 | 82.9 | 74.0 | 131 | 124 |
| Aged at 150° F., 13 days | 74.3 | 74.0 | *94.5 | *92.1 | 97.5 |

* Vulcanizate was curled, indicating precure.

TABLE 13. EFFECT OF SHELF AND OVEN AGING ON THE 300% MODULUS OF COMMERCIAL REPAIR CUSHION GUMS

(Vulcanized 35 Minutes at 260° F.)

| Sample | CA | CB | CC | CD | CE | CF | CG | CH |
|---|---|---|---|---|---|---|---|---|
| Unaged 300% modulus, psi. | 310 | 820 | 860 | 595 | 240 | 485 | 375 | 225 |
| | % Residual Modulus | | | | | | | |
| Aged at 72-83° F. for 240 days | 113 | 84.8 | 104 | 103 | 116 | 97.9 | 93.4 | 111 |
| 480 days | 108 | 76.0 | 88.6 | 93.8 | 86.5 | 77.3 | 94.0 | 98.7 |
| Aged at 100° F. for 240 days | 91.3 | 37.3 | 83.2 | 62.7 | 98.6 | 45.7 | 80.6 | 80.0 |
| 360 days | 80.6 | 18.5 | 79.4 | 41.6 | 76.6 | 35.4 | 63.7 | 55.8 |
| 480 days | 75.0 | 15.0 | 70.6 | 29.5 | 74.3 | 30.0 | 56.1 | 43.0 |
| Aged at 125° F. for 21 days | 71.0 | 61.6 | 76.2 | 84.9 | 68.7 | 63.0 | 84.0 | 64.5 |
| 42 days | 72.5 | 47.0 | 76.2 | 83.2 | 75.0 | 56.6 | 66.7 | 64.3 |
| Aged at 150° F., 13 days | 83.9 | 56.1 | *114 | 61.3 | 83.4 | 60.0 | 74.3 | 60.0 |

* Vulcanizates was curled, indicating precure.

TABLE 14. EFFECT OF SHELF AND OVEN AGING ON THE 300% MODULUS OF COMMERCIAL ALL-PURPOSE GUMS

(Vulcanized 20 Minutes at 280° F.)

| Sample | AA | AB | AC | AD | AE | AF |
|---|---|---|---|---|---|---|
| Unaged 300% modulus, psi. | 990 | 860 | 1250 | 660 | 525 | 970 |
| | % Residual Modulus | | | | | |
| Aged at 72-83° F. for | | | | | | |
| 240 days | 101 | 109 | 96.8 | 92.4 | 95.2 | 88.7 |
| 420 days | 70.1 | 100 | 86.7 | 84.3 | 85.1 | 46.1 |
| Aged at 100° F. for | | | | | | |
| 120 days | 67.7 | 103 | 87.2 | 81.9 | 79.0 | 34.0 |
| 240 days | 36.3 | 85.5 | 83.3 | 58.1 | 60.1 | NC |
| 360 days | 28.9 | 75.8 | 68.2 | 37.1 | 51.3 | NC |
| Aged at 125° F. for | | | | | | |
| 21 days | 90.0 | 106 | 105 | 102 | 90.5 | 85.0 |
| 42 days | 85.0 | 95.3 | 89.5 | 76.5 | 79.0 | 61.4 |
| Aged at 150° F., 12 days | 70.5 | 90.2 | 100 | 79.2 | 82.8 | 30.6 |

NC. No cure.

TABLE 15. EFFECT OF SHELF AND OVEN AGING ON THE 300% MODULUS OF COMMERCIAL QUICK-CURE TUBE GUMS

(Vulcanized 20 Minutes at 260° F.)

| Sample | TA | TB | TC | TD | TE | TF |
|---|---|---|---|---|---|---|
| Unaged 300% modulus, psi. | 260 | 335 | 495 | 640 | 210 | 265 |
| | % Residual Modulus | | | | | |
| Aged at 72-83° F., for | | | | | | |
| 240 days | 96.1 | 83.5 | | 93.0 | 105 | 104 |
| 420 days | 82.7 | 82.1 | 84.8 | 98.4 | 102 | 128 |
| Aged at 100° F. for | | | | | | |
| 90 days | 94.3 | 89.5 | 96.0 | 107 | 88.0 | 147 |
| 150 days | 94.3 | 92.5 | 90.0 | 109 | 85.6 | 132 |
| 270 days | *136 | 176 | 106 | 84.4 | *128 | *298 |
| Aged at 125° F., 42 days | 90.5 | 80.6 | 113 | 105 | 97.5 | 181 |

* Vulcanizate was curled, indicating precure.

45-minute cures, and they in turn were better than the 30-minute cures at 280° F.

Table 10 also shows that the majority of the loss occurred in the first week, and thereafter the loss was at a slower rate during this test at 125° F.

Permanent set tests run on the tread rubbers before and after 10 days' aging at 150° F. (not shown) indicated that the loss of modulus was due to deactivation of the curing system.

## Effect of Aging on the Curing Activity of Repair Materials

Of the original physical properties of these stocks only 300% moduli are shown because of space limitations. It should be stated, however, that they all were faster curing than the tread rubbers, as indicated from the data shown on the tables.

Tables 11 through 15 illustrate the effect of aging on the curing activity of the repair materials. The stocks varied widely in their residual modulus following aging. Particularly at 100° F. many of the samples suffered severe loss of curing activity.

As explained previously, the times of aging varied owing to the different times at which the groups of samples were received and because of expediency in the testing program.

As illustrated in Table 15, the quick-cure tube gums exhibited very good retention of cure rate. Because of the low original moduli of these tube gums and their rapid curing characteristics, any small error in curing or testing lead to a magnified error in the calculated percentage residual modulus figures in comparison to the results obtained with higher modulus stocks.

## Summary and Conclusions

During the aging of unvulcanized tread rubbers and repair materials prevulcanization, deterioration of curing activity and stiffening were found to occur. The degree to which these processes occurred was dependent upon the temperature and the time of storage and, presumably, the heat history and the composition of the rubber compounds.

Prevulcanization, deactivation of curing rate, and stiffening were found to occur simultaneously during aging at room temperature, at 100, 125, and 150° F., as measured by plasticity changes and/or modulus retention. At 200° F., prevulcanization was so rapid that trends toward deactivation of the curing system were obscured. The temperature dependence of the reactions appeared to vary widely for different stocks. The results of this program indicated that the maximum accelerated aging temperature at which reasonable estimations of probable shelf life can be determined is somewhere near 150° F., but definitely below 200° F. At 125° F., the results appeared to be somewhat more reliable than at 150° F., but a longer time was required. Work is being continued in an effort to establish more precise correlation between accelerated aging and normal storage.

An increased rate of stiffening was observed when specimens were aged under mild pressure, probably the result of accelerated interaction of polymer and pigment.

Prevulcanization of tread rubber and repair materials long has been recognized as a commercial problem. On the other hand, the deterioration of curing activity has not been recognized widely. Experimental evidence was found in this program to indicate that the deactivation of cure rate was associated with accelerator disappearance or deactivation.

Federal Specifications ZZ-T-416a[5] and ECO 35170-4 require that tread rubber and repair materials be satisfactory for their intended use for 12 months, provided the maximum temperature of storage has not exceeded 110° F. and that the average temperature has not exceeded 90° F. Although none of the samples tested failed by prevulcanization after 12 months at 72-83° F., the results at 100° F. indicate the possibility that some of the samples probably would have failed at 90° F., within 12 months by prevulcanization. Certainly, the data show that many of the stocks in this series would have suffered rather severe loss in curing activity if they had been stored at 12 months at 90° F.


## Acknowledgments

This work was a part of a development project under contract with the Ordnance Tank—Automotive Command, U. S. Army. The authors are grateful to R. H. Heinrich, of the Detroit Arsenal, for his cooperation in this program.


[5] FS ZZ-T-416a, "Tire and Tube Reconditioning Materials and Equipment," and its amendment, ECO 35170-4, may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

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# Cryogenic Studies of NR Seals

Evidence found via an investigation of suitable low-temperature seals indicates that O-rings of natural rubber are among the most promising materials in achieving good sealability at cryogenic temperatures (—120° F. and below). Preliminary studies have been conducted by D. H. Weitzel *et al.*, Cryogenic Engineering Laboratory, National Bureau of Standards.

The group examined O-rings and gaskets as well as numerous seal materials. At such cold temperatures the O-rings and seals become brittle and shrink away from confining flanges.

Two methods are being explored to provide a solution to the sealing problem. One method is to make seals by squeezing O-rings into the shape of thin circular gaskets, which may point to the use of natural rubber as promising material for cryogenic seals in missiles, rockets, and ground-supporting systems using liquefied gases. A second method, which combines machined flanges and the use of flat gaskets, shows Mylar as a promising low-temperature gasketing material.

# Compounding "Viton" for High-Pressure, High-Temperature Applications[1]

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## Compounding "Viton" for Hydraulic Hose

Early attempts to use "Viton" A fluoroelastomer for high-pressure, high-temperature hydraulic hose applications resulted in blistering during cure which limited the use of this grade of "Viton" for such service applications. By means of gas permeability tests and a simulated blistering test it was determined that one of the causes of blistering was the very high solubility of gases in "Viton" A, coupled with low diffusion rates.

The problem was solved by the use of a higher molecular weight copolymer, "Viton" A-HV, which has higher tensile strength and less tendency for air entrapment during compounding, and by proper choice of compounding ingredients. The use of one particular grade of magnesium oxide together with a special additive, N,N'-bis-(o-hydroxybenzylidene)-1,2-propylenediamine was found to be the most effective means of eliminating blistering.

IN RESPONSE to a need of elastomeric materials capable of performing at temperatures far above those practical for conventional elastomers, the rubber industry has in the past decade developed several useful classes of temperature-stable polymers. One of the more promising classes has been fluoroolefin polymers and copolymers, and a recent entrant from this class, "Viton" fluoroelastomer, is useful at temperatures up to 600° F.

Each elastomer has, of necessity, a very real use temperature ceiling whose height is determined by the bond energies of the component atoms and groups. The choice of these atoms and groups is limited by the requirements that the material be elastomeric, and that it contain potential cross-linking sites so that it can be vulcanized. Since the latter requirement often means that one must intentionally include thermally or chemically labile groups, it makes imperative the proper choice of compounding ingredients in order to develop an elastomer's full potentialities for a particular application. In essence it means that the compounding ingredients must be carefully chosen so as to facilitate rapid vulcanization without having deleterious side effects on the elastomer after vulcanization.

It is the object of this article to describe how the proper choice of compounding ingredients together with a slight copolymer modification helped solve a problem connected with the use of "Viton" fluoroelastomer in high-temperature applications.

[1] Presented before the Division of Rubber Chemistry, ACS, Chicago, Ill., Sept. 11, 1958. Contribution No. 85, Du Pont elastomer chemicals department.

## Properties of "Viton" Fluoroelastomers

"Viton" fluoroelastomer is a copolymer of vinylidene fluoride and hexafluoropropylene. The general structure and the raw copolymer properties of two grades, A and A-HV, are shown in Table 1.

"Viton" A has a Mooney viscosity similar to that of conventional elastomers, but that of A-HV is considerably higher. Neither polymer breaks down appreciably even after 30 minutes on a cold mill. "Viton" may be vulcanized by a variety of means—among them, use of difunctional amines, peroxides and high energy radiation. A typical formulation using the most commonly accepted curing agent, hexamethylenediamine

TABLE 1. RAW COPOLYMER PROPERTIES OF "VITON" A AND A-HV

| | | | |
|---|---|---|---|
| Structure | $-(CH_2CF_2)_n-CF_2-\underset{\displaystyle CF_3}{\underset{\vert}{CF}}-$ | | |
| | | A | A-HV |
| Specific gravity | | 1.8 | 1.8 |
| Mooney viscosity, ML-4/212° F.* | | 75 | 170 |
| Molecular weight ($M_N$) | | 100,000 | 200,000 |
| Appearance | | white, translucent | |
| Solubility | | ketones | |
| Storage stability | | excellent | |

* ASTM D 927-53T, American Society for Testing Materials, Philadelphia 3, Pa.

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## The Authors

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He was employed by Socony Mobil Co. in 1946-47, by Atlantic Refining Co. from 1947 until 1953, and joined the Du Pont organic chemicals department in 1954. In 1957 he was transfered to the Du Pont elastomer chemicals department, where he has been engaged in research on urethane and chlorosulfonated polyethylene elastomers and fluoroelastomers since that time.

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Mr. Moran is a member of the ACS and its Rubber Division.

T. Darrell Eubank, sales service representative on "Viton" for the Du Pont company, received his B.S. Ch.E. degree from Purdue University in 1951.

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carbamate, is shown in Table 2, together with physical properties. All samples reported on in this article have been given the standard "Viton" cure cycle—that is, a press cure of 30 minutes at 300° F., and an oven cure consisting of consecutive one-hour steps at 212, 250, 300, and 350° F., followed by 24 hours at 400° F.

The best general-purpose formulations utilize magnesium oxide as an acid acceptor for any small amount of hydrogen fluoride which may be evolved at service temperatures although other acid acceptors may be used where required. Combination retarder-activators are available to provide safer processing and are discussed more completely in another article.[2]

"Viton" stocks have good tensile strength which is adequate for most applications. The decrease in tensile strength, when measured at 300° F., is characteristic of fluoroelastomers. As illustrated in Tables 3 and 4,

[2] A. L. Moran, R. P. Kane, J. F. Smith, *Ind. Eng. Chem.*, 51, 83 (1959).

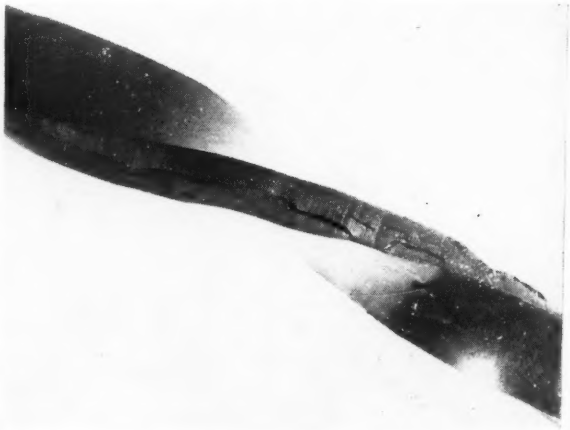

Fig. 1. Blistering of "Viton" in simulated test with 75-mil thick slab

TABLE 2. TYPICAL FORMULATION AND PROPERTIES OF "VITON" FLUOROELASTOMER

| | | |
|---|---|---|
| Recipe: "Viton" fluoroelastomer | 100 parts | |
| Magnesium oxide* | 15 | |
| MT carbon black | 25 | |
| Hexamethylenediamine carbamate† | 1.5 | |
| | "Viton" A | "Viton" A-HV |
| Mooney Scorch at 250° F. (MS)‡ | | |
| Minutes to 10-point rise | 10 | 5 |
| Hardness, Shore A§ | 71 | 71 |

| Stress/Strain¶ | 75° F. | 300° F. | 75° F. | 300° F. |
|---|---|---|---|---|
| Modulus at 100%, psi. | 810 | — | 890 | — |
| Tensile at break, psi. | 2250 | 550 | 2725 | 720 |
| Elongation at break, % | 180 | 90 | 190 | 90 |

* Darlington 601, Darlington Chemical Co., Philadelphia 2, Pa.
† "Diak" #1, Du Pont.
‡ ASTM D 1077-49T.
§ Instantaneous readings on Shore A durometer, Shore Instrument Co., Jamaica, N. Y.
¶ ASTM D 412-51T, using dumbbell with 0.025-inch neck and one-inch bench marks.

TABLE 3. HEAT RESISTANCE OF "VITON" A-HV VULCANIZATES*

| Stress/Strain after Exposure Shown | 28 Days at 450° F.† | 16 Hours at 600° F.† |
|---|---|---|
| Tensile strength, % retained | 80 | 67 |
| Elongation at break, % retained | 70 | 48 |
| Hardness, Shore A, pts. change | +7 | +12 |
| Weight loss, % | — | 7 |
| Estimated Maximum Service Life— | Time to Brittleness | |
| 400° F. | >2400 hours | |
| 450° F. | 1000 hours | |
| 500° F. | 250 hours | |
| 550° F. | 72 hours | |
| 600° F. | 24 hours | |

* Same recipe as Table 2.
† Aging in circulating air oven.

TABLE 4. OIL, CHEMICAL, AND SOLVENT RESISTANCE* OF "VITON" A-HV†

| | Immersion Time—7 Days | | | |
|---|---|---|---|---|
| Fluid | Temp. °F. | % Vol. Increase | Tensile, % Retained | Hardness Pts. Change |
| Petroleum aircraft fuel‡ | 75 | 0.4 | 100 | + 1 |
| ASTM #3 Oil | 300 | 4.3 | 95 | − 1 |
| Diester lubricant§ | 400 | 19.6 | 60 | − 6 |
| Benzene | 75 | 19.6 | 73 | − 9 |
| Acetone | 75 | 271.0 | — | −11 |
| Conc. NaOH 47% | 75 | 2.1 | 75 | + 1 |

* ASTM D 471-54T.
† Same recipe as Table 2.
‡ JP-5 (MIL-F-5624-C), Air Force jet-engine fuel.
§ Turbo Oil #15 (MIL-L-7808), Esso Standard Oil Division, Humble Oil & Refining Co., New York, N. Y.

TABLE 5. HIGH-TEMPERATURE, HIGH-PRESSURE HYDRAULIC HOSE FORMULATION USED IN EARLY FIELD TRIALS

| Compound | Parts |
|---|---|
| "Viton" fluoroelastomer, MW = 60,000 | 100 |
| Zinc oxide | 10 |
| Dibasic lead phosphite* | 10 |
| MT carbon black | 60 |
| Hexamethylenediamine carbamate | 1.25 |

* Dyphos, National Lead Co., New York 6, N. Y.

products made from "Viton" retain their rubbery characteristics even after prolonged exposure to temperatures in the range of 400 to 600° F. and, in addition, show excellent resistance to many fluids at both room and elevated temperatures.

## Blistering Phenomenon

The excellent combination of high use temperature and a high degree of solvent resistance led to evaluation of "Viton" fluoroelastomer for high-temperature, high-pressure hydraulic hose. The need for such a hose, capable of performance at 400° F. and up to 3,000 psig., has arisen because of the stringent requirements of modern engines, both military and civilian. Early field evaluations, however, with hydraulic hose made from a prototype of "Viton" A (MW = 60,000) uncovered a blistering problem which threatened its successful application. The blistering occurred when the hose was used at 400° F. with Turbo Oil #15, a diester lubricant, as the hydraulic fluid. The recipe used in the early field trials is shown in Table 5.

The blistering phenomenon is illustrated in Figure 1, which is a photograph of the blistered cross-section of a 75-mil thick slab. The blistering, which was accomplished in a simulated test described below, is exaggerated, but nevertheless illustrative of the virtual delamination which can occur.

## Simulated Blistering Test

Since cured "Viton" can withstand immersion into Turbo Oil #15 at 400° F. for seven days without signs of blistering, it seemed apparent that the blistering must be due to the compression and subsequent expansion of some gaseous material present or formed in "Viton." To study the phenomenon, a simulated test was devised which permitted the rapid qualitative determination of the degree of blister-resistance of various experimental samples.

The test consists of suspending a one- by one- by 0.075-inch specimen in Turbo Oil #15 contained in a standard autoclave. The oil is heated to 400° F. as rapidly as possible, and the autoclave is then pressured to 1000 psig. with nitrogen and held there for one hour. The pressure is then released; the oil cooled rapidly to 300° F., and the specimens removed for visual inspection of the degree of blistering. The pressure, temperature, and time cycle may, of course, be varied, as

TABLE 6. BLISTERING OF "VITON" A-HV IN TURBO OIL #15 AFTER ONE HOUR EXPOSURE AT 400° F.

| Test Conditions | | | |
|---|---|---|---|
| Pressure, psi. | Gas | Other | Blistering |
| 1000 | $N_2$ | (standard test) | considerable |
| 1000 | $N_2$ | pressure let down over 2-hr. period, held at 400° F. 8 hrs., before cooling | very slight |
| 1000 | $N_2$ | no oil | considerable |
| 500 | $CO_2$ | same as standard test except for gas | considerable |
| 1000 | He | no oil | slight |
| 1000 | none | hydraulic pressure using "degassed" oil | none |

| Compound: | |
|---|---|
| "Viton" A HV | 100 parts |
| Magnesium oxide* | 15 |
| MT carbon black | 60 |
| Hexamethylenediamine carbamate | 1.25 |

* "Maglite" D, Merck & Co., Inc., Marine Magnesium Division, Rahway, N. J.

TABLE 7. GAS PERMEABILITY* OF "VITON" A FLUOROELASTOMER

| | Gas | 86° F. | 140° F. | Activation Energy ΔH (kcal/mol) |
|---|---|---|---|---|
| Permeability, $Q \times 10^8$ (in cc. $cm^{-1}sec.^{-1}atm^{-1}$) | $N_2$ | 0.330 | 2.60 | 13.8 |
| | $O_2$ | 1.09 | 6.66 | 12.1 |
| | $CO_2$ | 5.87 | 29.8 | 10.8 |
| | He | 16.1 | — | — |
| Diffusion Constant, $D \times 10^6$ (in $cm^2sec.^{-1}$) | $N_2$ | 0.039 | 0.33 | 14.1 |
| | $O_2$ | 0.082 | 0.66 | 13.9 |
| | $CO_2$ | 0.033 | 0.25 | 13.6 |
| | He | 10† | — | — |
| Solubility, $h \times 10^2$ (in cc. $cm^{-3}atm^{-1}$) | $N_2$ | 8.4 | 8.0 | − 0.3 |
| | $O_2$ | 13.3 | 10.1 | − 1.8 |
| | $CO_2$ | 177 | 117 | − 2.8 |
| | He | 1–2† | — | — |

* Measurements made according to method of Van Amerogen.[3]
† These values are estimated because of the high permeability of He.

necessary, to obtain further differences in exposure conditions. In general, the severity of blistering increases with increasing pressure and exposure time. A temperature of 400° F. was used for all tests described in this article.

## Mechanism of Hose Blistering

By varying the conditions of the test and observing differences in the degree of blistering obtained, an insight has been gained into the way "Viton" blisters not only in the simulated test, but also in actual use. Based on these and related tests, it seems apparent that one of the fundamental causes of the hose blistering is the very high solubility of gases in "Viton" coupled with extremely low diffusion rates. In high-pressure hydraulic hose the low gaseous diffusion rate permits compression of any gas present in the stock. This compressed gas can presumably collect in tiny voids in the stock and blister when its pressure exceeds the tensile strength and/or tear strength.

That such a mechanism is a reasonable one is shown by the experiments, using a "Viton" A-HV stock, which are summarized in Table 6. It is obvious from the data that in the simulated test the gas used to pressurize the system becomes dissolved in the stock and contributes to blistering. Since it provides an inexhaustable gas source it means, in effect, that the conditions existing in the simulated test are probably much more rigorous than those met in actual use where only small amounts of gas can be present.

When the samples are heated in the oil in the absence of pressure, or if the pressure is released gradually, little or no blistering occurs, indicating that if sufficient time is allowed for the blister-producing gas to diffuse out, no blistering will occur. When other gases were used to pressurize the system, the degree of blistering was affected, indicating that these gases were participating in the blistering. Thus, when carbon dioxide was used instead of nitrogen, the blistering was more pronounced; when helium was used, it was much less pronounced.

Measurement of their gaseous diffusion rates through a "Viton" A gum stock cured by a 121-watt sec. $cm^{-2}$ $\beta$ ray exposure (Table 7) showed that their solubilities decreased in the order $CO_2 > N_2 > He$, and their diffusion rates increased in the order $CO_2 < N_2 < He$. Thus maximum blistering should take place with $CO_2$ because of the high solubility and low diffusion rate; minimum blistering should occur with helium because of the lower solubility and higher diffusion rate.

Comparison of "Viton" fluoroelastomer with other elastomers (Table 8) shows that "Viton" is about as impermeable to nitrogen, oxygen, carbon dioxide, and helium gases as butyl and Hycar OR-15.[3] The diffusion constants, a measurement of the ease with which a gas molecule can move past the polymer chains, indicate that "Viton" possesses a lower chain mobility than other elastomers. The high activation energies for diffusion shown in Table 7 are in agreement with the extraordinarily low diffusion constants.

Although the solubility of a given gas usually does not vary very much from elastomer to elastomer, the gases reported are more soluble in "Viton" than in any other reported elastomer. The low diffusion rates and high solubilities of gases in "Viton," therefore, appear to be a reasonable basis for the mechanism of blistering previously proposed.

When the blistering test is carried out in the absence of Turbo Oil #15, the degree of blistering is unchanged, indicating that gas from "Viton"-oil reaction

[3] G. J. Van Amerongen, *J. Polymer Sci.*, 5, 307 (1950).

TABLE 8. COMPARATIVE GAS PERMEABILITIES AT 86° F.*

| | Natural Rubber | Butyl Rubber† | Hycar 1001‡ | "Viton" A |
|---|---|---|---|---|
| | | Permeability§ | | |
| $N_2$ | 8.7 | 0.35 | 0.26 | 0.33 |
| $O_2$ | 23 | 1.3 | 1.03 | 1.09 |
| $CO_2$ | 123 | 5.2 | 7.6 | 5.87 |
| He | 28 | 7.8 | 6.4 | 16.1 |
| | | Diffusion Constant§ | | |
| $N_2$ | 1.6 | 0.063 | 0.091 | 0.039 |
| $O_2$ | 2.2 | 0.11 | 0.18 | 0.082 |
| $CO_2$ | 1.4 | 0.081 | 0.055 | 0.033 |
| He | 24 | 6.9 | 9.3 | 10 |
| | | Solubility§ | | |
| $N_2$ | 5.7 | 5.6 | 2.9 | 8.4 |
| $O_2$ | 10.3 | 11.8 | 5.6 | 13.3 |
| $CO_2$ | 90 | 65 | 137 | 177 |
| He | 1.2 | 1.2 | 0.7 | 1–2 |

* Data for NR, IIR, and NBR interpolated from the data of Van Amerogen.[8]
† Enjay Co., Inc., New York 19, N. Y.
‡ B. F. Goodrich Chemical Co., Cleveland 15, O.
§ Same units as in Table 7.

TABLE 11. COMPOUNDING "VITON" FOR BLISTER RESISTANCE

| Compound | 1 | 2 | 3 |
|---|---|---|---|
| "Viton" A-HV | 100 | 100 | 100 |
| Magnesium oxide* | 15 | 15 | — |
| Zinc oxide | — | — | 10 |
| Dibasic lead phosphite | — | — | 10 |
| MT carbon black | 60 | 20 | 60 |
| N,N′-bis(o-hydroxybenzylidene)-1,2-propylenediamine | 1.3 | 1.3 | 1.3 |
| Hexamethylenediamine carbamate | 1.25 | 1.25 | 1.25 |
| Tensile Strength at Break, psi. | | | |
| 75° F. | 2750 | 2550 | 2725 |
| 300° F. | 775 | 675 | 725 |
| Mooney Scorch at 250° F. (MS) | | | |
| Minutes to 10-point rise | 42 | 42 | 18 |
| Simulated Blistering Test Results† | | | |
| One hour at 800 psi. ($N_2$) | O | B | O |
| 1000 psi. | O | B | B |
| 1400 psi. | O | B | B |

* "Maglite" D.
† See Legend, Table 10.

TABLE 9. PREFERRED FORMULATION FOR HIGH-TEMPERATURE, HIGH-PRESSURE APPLICATIONS

| | |
|---|---|
| "Viton" A-HV | 100 parts |
| Magnesium oxide* | 15 |
| MT carbon black | 60 |
| N,N′-bis(o-hydroxybenzylidene)-1,2-propylenediamine† | 1.3 |
| Hexamethylenediamine carbamate | 1.25 |

* "Maglite" D.
† "Copper Inhibitor"-65, Du Pont.

TABLE 10. COMPOUNDING "VITON" FOR BLISTER RESISTANCE

| Compound | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| "Viton" fluoroelastomer, $\overline{M}_N$* 200,000 | 100 | 100 | — | — |
| $\overline{M}_N$* 100,000 | — | — | 100 | — |
| $\overline{M}_N$* 60,000 | — | — | — | 100 |
| Magnesium oxide† | 15 | 15 | 15 | 15 |
| MT carbon black | 60 | 60 | 60 | 60 |
| N,N′-bis(o-hydroxybenzylidene)-1,2-propylenediamine | — | 1.3 | 1.3 | 1.3 |
| Hexamethylenediamine carbamate | 1.25 | 1.25 | 1.25 | 1.25 |
| Tensile Strength at Break, psi. | | | | |
| 75° F. | 1950 | 2750 | 2375 | 2100 |
| 300° F. | 350 | 775 | 725 | 650 |
| Mooney Scorch at 250° F., (MS) | | | | |
| Minutes to 10-point rise | 3 | 42 | 42 | 42 |
| Simulated Blistering Test Results‡ | | | | |
| One hour at 600 psi. ($N_2$) | B | O | O | O |
| 800 psi. | B | O | O | B |
| 1400 psi. | B | O | B | B |

* Number average molecular weight.
† "Maglite" D.
‡ Legend: B = blistered; O = blister-free.

or copolymer-catalyzed oil degradation is not the principal cause of the blistering in the simulated test. It does not, however, obviate the possibility that dissolved gases in the oil or volatile components could still be partially responsible for blistering in use applications.

## Elimination of Blistering in "Viton" Hose Stocks

From information gained in the above studies it is apparent that anything which will reduce the amount of gas present in the stock or which improve the tensile strength should reduce blistering. The preferred stock for accomplishing this with "Viton" is shown in Table 9. This stock did not blister in the simulated test under standard conditions; whereas the prototype "Viton" A, compounded as shown in Table 5, blistered at pressures as low as 600 psi. It is to be expected that hose made from the preferred stock will withstand pressures even greater than the 1000 psi. used in the simulated test.

As shown in Tables 10 and 11, the improved performance of the preferred stock may be ascribed to a number of factors: First of all, the use of "Viton" A-HV with its higher molecular weight results not only in higher tensile strength in the vulcanized stock but also in less air entrapment during compounding. "Viton" A may be quite satisfactory for less demanding hose applications. Although its molecular weight is only 50% that of A-HV, it is 70% higher than its early prototype and thus has less blistering tendency than the prototype.

The use of magnesium oxide as acid acceptor in place of zinc oxide/dibasic lead phosphite results in improved aging characteristics and also decreases the tendency to split-off hydrogen fluoride, thus minimizing another potential source of blister-producing gas. The inherently more scorchy nature of the magnesium

TABLE 12. EFFECT OF MAGNESIUM OXIDE GRADE ON HOSE BLISTERING

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Compound | | | | | | | | |
| "Viton" A-HV | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| "Maglite" D, MgO | 15 | 15 | — | — | — | — | — | — |
| K, MgO | — | — | 15 | 15 | — | — | — | — |
| XLC, MgO* | — | — | — | — | 15 | 15 | — | — |
| Darlington 601 MgO | — | — | — | — | — | — | 15 | 15 |
| MT carbon black | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| N,N′-bis(o-hydroxybenzylidene)-1,2-propylenediamine | — | 1.3 | — | 1.3 | — | 1.3 | — | 1.3 |
| Hexamethylenediamine carbamate | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| Tensile at Break, psi., 75° F. | 1950 | 2750 | 2350 | 2200 | 2625 | 2625 | 2375 | 2375 |
| 300° F. | 350 | 775 | 775 | 850 | 775 | 900 | 850 | 775 |
| Compression Set (B)† | 60 | 22 | 16 | 19 | 26 | 19 | 22 | 15 |
| Simulated Hose Blistering Results‡ | | | | | | | | |
| One hour at 1000 psi. ($N_2$) | B | O | B | B | B | B | B | B |

* Keasby & Mattison, Ambler, Pa.
† ASTM D 395-53T, 70 hours at 250° F.
‡ See Legend Table 10.

oxide stock can be counteracted by using N,N′-bis(o-hydroxybenzylidene)-1,2-propylenediamine which provides adequate processing safety (Table 11).

The exact role which N,N′-bis(o-hydroxybenzylidene)-1,2-propylenediamine plays in hose blistering is not yet completely understood. Certainly, in its role as a cure retarder-activator it modifies the vulcanization reactions and may well promote more controlled evolution and absorption of the hydrogen fluoride produced during cure. The increased hot tensile strengths and higher state of cure which result also contribute undoubtedly to blister resistance. These effects are not the only ones, however, because the effectiveness of the N,N′-bis(o-hydroxybenzylidene)-1,2-propylenediamine is closely related to some property of the magnesium oxide. In combination with "Maglite" D magnesia, the N,N′-bis(o-hydroxybenzylidene)-1,2-propylenediamine has a very marked effect on blister resistance which cannot be demonstrated with any other grade of magnesia which we have investigated.

It appears likely that the specificity of "Maglite" D is due to the fact that it has a greater surface area (both internal and external) than the other magnesium oxide samples tested, thus resulting in a greater capacity for absorbing hydrogen fluoride. A further difference which can be demonstrated between various magnesium oxides is their effect on the state of cure attained using a given curing agent level with or without the presence of N,N′-bis(o-hydroxybenzylidene)-1,2-propylenediamine. As shown in Table 12, however, blister resistance cannot be coordinated simply with state of cure alone.

Early attempts to use "Viton" A fluoroelastomer for high-pressure, high-temperature hydraulic hose applications uncovered a blistering phenomenon which limited the application of this fluoroelastomer for such service. Studies utilizing a simulated blistering test and gas permeability tests have shown that blistering can be prevented by a slight copolymer modification and by proper choice of compounding ingredients.

The improved performance of "Viton" A-HV in high-temperature, high-pressure hose applications is ample demonstration of the way in which the proper choice of base stock and proper compounding can solve many high-temperature application problems. The field of high-temperature elastomers is so new that much progress can yet be expected with respect to compounding technology and the application of special additives such as N,N′-bis(o-hydroxybenzylidene)-1,2-propylenediamine in order to obtain the most performance-wise from the new high-temperature elastomers.

## Acknowledgment

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## *European Technical Digests*

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# MEETINGS and REPORTS

# "Materials Handling" Panel Coverage Broad at Akron RG

The winter meeting of the Akron Rubber Group held at the Sheraton Hotel, Akron, O., January 29, featured a symposium on "Materials Handling," which was conducted in a new and novel manner. This afternoon technical program was followed by a suppliers' cocktail party and dinner, at which the speaker was the very entertaining Mack Sauer, who is a writer, editor, and president of radio station WSRW of Hillsboro, O.

## Dinner Program

Group Chairman Milton Leonard, Columbian Carbon Co., presided at the evening dinner program. It was announced that the Group would cosponsor with the University of Akron, beginning this year, the University's annual Rubber Science Hall of Fame[1] selection and banquet.

The ARG will hold another dance some time this year, which will be the second in its history; the first was held in November 1959.

Membership in the Group at the present time totals 1,671.

Nominations for new officers for 1960-61 were announced by George Hackim, General Tire & Rubber Co., nominating committee chairman, as follows: chairman, I. J. Sjothun, Firestone Tire & Rubber Co.; vice chairman, John Gifford, Witco Chemical Co., and C. W. Stalker, General Tire; secretary, R. B. Knill, Goodyear Tire & Rubber Co., and Ben Kastein, Firestone; treasurer, B. N. Larsen, Naugatuck Chemical Division, United States Rubber Co., and L. A. Anderson, L. A. Anderson Co.

## "Materials Handling" Symposium

Moderator for the symposium on "Materials Handling," was L. M. Baker, General Tire, who pointed out that the work and expense in this area of manufacturing activity accounted for as much as 33% of all labor costs. He explained that the Group program would be handled in a new manner, that is, it would be assumed that each member of the audience was a staff member of the ARG Rubber Co., Inc., sitting in on a conference on materials handling problems, with Mr. Baker presiding as factory manager of the rubber company. The panelists were being brought in as well-qualified consultants to the ARG Rubber Co. to answer questions in their special fields of materials handling as previously provided Mr. Baker by his staff members. Mrs. John Crowe, acting as secretary to Mr. Baker, conducted each panelist or consultant on to the stage and introduced each to the factory manager and the staff members present at the conference which added a very welcome and interesting new aspect to the program. The panelists, the moderator, and Mrs. Crowe are shown in Figure 1.

**"Raw Material and Finished Goods Handling"** was the subject covered by E. L. Hineline, Firestone. In discussing the handling of raw materials from the supplier to the rubber industry consumer, the handling of these materials onto the consuming plants, handling in storage, and in primary operations, Mr. Hineline stressed the following principles:

(1) Handle all materials wherever possible in largest and most inexpensive unit container practical to transport to, in, and at usage point for minimum handling costs. Eliminate rehandling wherever possible, and do not rehandle except in same or larger unit, or in bulk with automatic weighing and proportioning equipment unless such rehandling is economical.

(2) Use bulk handling wherever possible because of savings in floor space and labor. With unit handling, pile pallet loads as high as possible, and standardize load weight at not less than 2,500 pounds per unit to permit standardization of power equipment, as well as standardizing pallet size, wherever possible, at 42 by 48 inches, which is the best size for bag and drum material both in plant and in freight cars and trailers.

(3) Encourage reduction in the number of materials used, and have vendors supply materials on expendable pallets or containers wherever possible and economical.

(4) Standardize in-plant truck size at 24 inches, 4000-pound capacity, except for mold handling; use standard fork trucks wherever possible with adapters such as forks, side movement, pin or post and hoist hook attachments so that trucks are multiple-purpose.

(5) Wood pallets are less expensive than steel and with normal usage will last for 10 years, and the latter are more difficult to maintain than wood. Expendable pallets, if furnished by the vendor at low cost, may offset the cost of wood or steel pallets.

(6) Normal raw material warehouse space should be figured on the basis of 125 pounds load per square foot for hand piling, including aisles and voids; 250 pounds per square foot load for pallet piling. All floors should be designed to allow for loads of at least 400 pounds per square foot.

General Tire Photo

Fig. 1. Panelists and secretary, *left to right*, seated: L. E. Soderquist; Mrs. John Crowe, who acted as secretary; L. M. Baker, moderator; and J. L. Hawley. Standing, *left to right:* P. W. Watt, E. L. Hineline, C. W. Hibscher, and D. C. Price

[1] RUBBER WORLD, Jan., 1960, p. 532.

(7) Single-story warehouses are more economical to operate than multi-story based on initial cost, labor, transportation of material, etc.

Bulk handling systems for a minimum of six to eight different grades of black and including automatic weighing cost $75,000 to $150,000 per Banbury mixer; other systems such as the use of tote bins cost about $30,000 per Banbury mixer for handling two different grades of black. Savings with bulk handling over handling carbon black in bags, including the lower cost of the black in bulk, floor space saved, etc. amount to about 0.0075¢ per pound used.

Using tires to illustrate both in-process and finished goods handling, Mr. Hineline pointed out that with the advent of automatic curing units, 20,000 to 30,000 cured passenger-car tires can be handled over one conveyor system in 24 hours. The tires are automatically divided into two or three lines for trimming, painting, and inspection, with the black and black-white sidewall tires being handled at the same time. Final inspection can separate bead diameters to different routes, and white sidewall tires can be separated from all-black tires photoelectrically.

All tires can be palletized, it was said, but it is not economically practical to ship tires on pallets. The industry is storing tires three to four pallets high, and figures for such storage were provided by the speaker.

There were several questions sent in for answer by Mr. Hineline, and although they were not a part of the program as presented, because of time, they are reported herewith:

**Q. Discuss the bulk handling of powdered materials, which are handled in bulk; what are the economics of such bulk handling, and what are the recommended systems for each type?**

**A.** Clay and whiting can be handled with railroad hopper car and vacuum with the same system as for carbon black, with a saving of $3.50 per ton plus other savings in handling costs in the consuming plant. Zinc oxide can be handled in the regular hopper car, tote bin, or with rubber bag containers such as U. S. Rubber Co.'s Sealdbin. Some slight savings may result.

**Q. What basic equipment is required, and what is the minimum capital investment in materials handling equipment for a firm using about one million pounds of raw materials monthly?**

**A.** On the basis 50,000 pounds of material per day, the best method would be with lift trucks and pallets. The pallet holds 2,500 pounds and cost $4 each. The 4,000-pound capacity fork lift truck cost $7,500. The handling with one such truck and 600 pallets would require an initial investment of $9,900. Storage three feet high, 250 pounds load per square foot, 33% allowance for aisles and voids, would require 6,000 square feet of floor space on a 30-day basis.

**Q. What type of bulk system is recommended for handling carbon black in a plant using 10 million pounds of four to eight different grades of black a year?**

**A.** A bulk hopper car with different sections for each of four to eight blacks of 35,000-pound capacity each, situated above a building or on ground and with six compartment surge hopper and weighing equipment is recommended. Estimated saving is 0.0075¢ per pound of black handled.

An alternate method would be to unload hopper cars into tote bins and handle bins to floor above Banbury mixer or empty them into an elevator that would fill six compartment surge bins above the Banbury. Esitmated saving is 0.0065¢ per pound of black handled.

Rubber bag containers can be used, but a complete study of source, shipping, and black costs would have to be made.

**Q. Compare bulk storage (Silo) of powdered materials to smaller sized bin storage and handling (tote system or U. S. Rubber Sealdbins).**

**A.** A comparison of Silo, Tote Bin, and Sealdbin methods is given below:

| | Silo | Small Silo | Tote Bins in Yard | Sealdbin in Yard |
|---|---|---|---|---|
| Equipment cost Banbury | $300,000 | $160,000 | $137,500 | $130,000 |
| Capacity, lbs. | 800,000 | 280,000 | 250,000 | 250,000 |
| Equipment cost each additional Banbury | $50,000 | $40,000 | $35,000 | $35,000 |
| Savings lb., ¢ | 0.0075 | 0.0075 | 0.0065 | 0.0065 |
| Unloading and loading time, hrs. car | 3 | 5 | 24 | 24 |

**Q. What size pallets should be used for raw material storage?**

**A.** Pallets of 42 by 48 inches are recommended for sacks and drums; pallets of 48 by 48 inches for natural rubber bales, eight per pallet.

**Q. How would rubber sheets 40 inches square and of various thicknesses be handled automatically, stacked, and fed into process?**

**A.** The automatic cutters and stackers of Spadone Machine Co. and Akron Standard Mold Co. should be investigated for these purposes.

**Q. What will be the impact of increasing mechanization in the rubber industry on the future handling of densified or pelletized zinc oxide?**

**A.** Zinc oxide can be handled mechanically and automatically weighed in a similar manner as clay.

**Q. Would zinc oxide be more satisfactory for handling if packed in valve bags rather than the conventional type?**

**A.** All powdered pigments handle better in valve-type paper bags.

**Q. Do you think zinc oxide will be incorporated in SBR carbon black masterbatches in the future, thus eliminating storage and handling of zinc oxide in the rubber goods plant?**

**A.** Incorporation of zinc oxide in SBR-black masterbatches may be possible, but it would increase the number of types of such rubbers in the inventories of producing and consuming plants.

**Q. What are the most efficient units for pelletizing the softer SBR polymers without the heavy use of talc?**

**A.** At present we know of no pelletizing equipment that will handle soft SBR polymers without the heavy use of talc.

**Q. What is new in valves for handling tacky latex compounds and viscous resins from drums and tanks? Is there a better valve than the standard molasses valve?**

**A.** Molasses valves are best for drum and tank outlets. If the valves are in a line, Sinclair-Collins diaphragm closure-type valves are very satisfactory.

**Q. Outline several of the more efficient and economical methods for carrying Banbury mixed masterbatches from the first to second floor for storage and subsequent further mixing in the Banbury.**

**A.** A festoon cooling unit with a festoon piler may be used on the first floor to handle the stock from the sheeting mill, and it may be then conveyed to the second floor by a festoon piler. An alternate method is to pelletize the masterbatch and handle and store pellets in the conveyors.

**Q. What is the best method for handling and storing tire cord fabric?**

**A.** Tire cord fabric should be stored on flat surfaces in racks or on the floor.

**Q. Discuss the best means of handling and storing camelback where there are a large number of sizes and relatively small quantities of each size.**

**A.** Camelback can be stored on the type of pallet used for handling cured passenger-car tires or on a special pallet universally fitted to all sizes of boxes. Each pallet holds approximately 1,700 pounds, and the pallet can be stored four feet high.

**Q. What will be future developments in automatic trimming and inspection of tires and other rubber goods to decrease the manpower required in this area of manufacture.**

**A.** Conventional treads can be trimmed, but not inspected automatically except for the automatic loading and unloading which has been developed. Automatic balancing, marking, and sorting have been developed by Micropoise Co., whereby two sizes such as 14- and 15-inch can be handled on one machine.

**"Automatic Weighing Trends in the Rubber Industry"** was next discussed by Carl W. Hibscher, Toledo Scale Corp. It was pointed out first that in any automatic weighing process there are three basic elements: the scale, the materials handling equipment, and the controls. In addition, in automatic weighing, a system is usually a custom engineered and manufactured unit because few customers' processes are identical.

Mr. Hibscher described a recently developed automatic tread classifier which classifies 15 treads per minute with a zone edge accuracy of 1/20-pound. This unit consists of a motorized belt conveyor, a standard "A" type scale lever system, a high-speed scale head, an electrical weight transducer, and an electronic control unit. In operation, the automatic tread classifier has an "OK" or ideal weight zone, which will classify, say, a 50-pound tread ±0.15 pound. The tread unit will classify treads into three zones in addition to the "Over" and "Under" zones. The "OK" zone would range from 49.85 to 50.15 pounds; the "OK Over" zone from 50.15 to 50.30 pounds; and the "OK Under" from 49.85 to 49.70 pounds. All other weights would be rejects.

It was emphasized that the automatic tread classifier, except for the belt conveyor, had practically no moving parts and would therefore have long and trouble-free service life and require a minimum of maintenance.

In the field of proportioning (batching) Toledo Scale's most recent advancements in conjunction with micro weighment oil batching, pigment batching, and simplified automatic batching controls were discussed next.

The Micro Weighment Oil Batching Scale has a 10-pound capacity and weighs oil automatically to 1/100-pound or about 1/5-ounce and has become very popular in the final mixing of rubber compounds, it was said. There is no limit to the number of oils that can be handled, but the total weight of a batch cannot exceed 10 pounds. A cylinder-operated ball-type valve has been found to be most satisfactory for use with this scale. Figure 2 shows the Toledo Micro Weighment Oil Scale with the vernier Remoset for weight setting.

Fully automatic pigment handling may be accomplished with a "portable bin" type system or a "permanent surge bin" type system. The portable bin is employed where preblended pigments can be dumped into this bin at the blending mixer and serves as an intermediate storage means, as well as a hopper. When the particular blend is required, the portable bin is placed in its respective position on the support frame over the pigment scale. The portable bin has a live bottom composed of a series of powered screw flights to aid the movement of the pigments. The portable bin supplies material to a small surge bin which

**Fig. 2. Toledo Micro Weighment Oil Scale and vernier Remoset for weight setting**

terminates in the scale feeding device.

The permanent surge bin system employs a manually filled permanent surge hopper in place of the portable bin; the live bottom of the latter is replaced by a special bin design for the former. An additional attachment to the surge hopper type system is a pneumatic conveying system, used to fill the respective surge hoppers from a remote control point. With this feature the central supply point usually supplies more than one Banbury mixer.

Automatic batch controls are predominately of the remote preset type, with the vernier dial and the digital dial types used mostly heretofore. More recently, the punched card, the Batchboard, and the Formulaplug have been introduced. The punched card-type preset method has the advantages of being able to accommodate major formulation changes quickly and that the formulation is controlled by the supervisor and is not dependent upon the operator. A disadvantage of the card system is that it leaves something to be desired when subjected to the environment of a rubber plant, since it is not a rugged piece of equipment.

The Batchboard system has all the attributes of the card system, plus both mechanical and electrical ruggedness, and is considerably less expensive for most applications. The Formulaplug has most of the advantages of the Batchboard system and is the least expensive method of remotely presetting weights available today.

Mr. Hibscher showed an illustration of a modern control center using the miniature plug-in component design and stated that this type of system is the modern approach to industrial scale controls for a number of reasons.

With regard to future trends, it was said that there would be only minor improvements in tread classifying equipment, and that the basic classifier will be employed in many new applications. Examples of the latter were given as: "closing the loop" in extruder feed control, so that the required tread stock weight is automatically maintained within tolerence without operator attention; classification of finished tires; and classification of packages in mechanical goods plants.

Mr. Hibscher predicted a trend toward weighing on a small incremental basis at high frequencies, as mentioned by Andrew Hale, of Hale & Kullgren, in his recent paper on "New Rubber Processing Techniques for the Sixties," as presented before the International Rubber Conference, November, 1959, Washington, D. C. [A rewritten version of Mr. Hale's paper appears elsewhere in this issue. EDITOR.]

Although it was emphasized that improvement in automatic weighing and handling methods in the rubber industry is aided by improvements in material handling equipment, further major contributions will come from improving the manageability of the materials themselves, that is, by increased pelletization of pigments. Weighing controls are going to continue the process of evolution until the use of solid state (static switching) type becomes universal. As a counterpart to solid state switching equipment, the batching cycle logic will be stored on magnetic tape or some other form of solid state storage, it was added. The magnetic tape will become necessary if the operatorless automatic system is to be achieved.

**"Handling in a Mechanical Goods Plant"** was described by Don C. Price, of Monarch Rubber Co. It was pointed out that the equipment to handle materials for the production of 500 separate products varying in size from a ⅛-inch kitchen-cabinet door bumper to a 48-inch-diameter solid tire with a 38-inch steel rim would cover a very wide range of sizes and types.

Mr. Price limited his discussion, therefore, to the development of the use of a standard bottom dump box, slightly altered to fit a special attachment on a fork lift truck, for handling metal scrap and materials for rubber-to-metal products, and the development of a special hydraulically operated knock-out frame called a "shuttle car," which operates along a press line to receive each mold and eject parts from their cavities.

In developing the use of the dump box, a relatively inexpensive and low-in-maintenance cost container adaptable for handling most of the finished metal parts as well as scrap was required. In addition, the container could not weigh more than 6,000 pounds gross; any attachments for the lift trucks for handling the box could not interfere with other methods for using these trucks; and the savings achieved by the use of the new equipment should be such as to permit paying off the investment in a matter of weeks.

The problem was solved with the co-

operation of a materials handling equipment supplier, and the box and the lift truck attachment are successfully used not only for moving and handling metal scrap, but in every phase of motor mount production at Monarch. Figure 3 shows the dump box and the mast attachment on the lift truck as used by Monarch Rubber.

The special "shuttle car" was required because it became necessary for Monarch to reduce its manpower requirements in molding for a certain order. Instead of an electric chain hoist and one fixed floor-mounted knock-out frame, the hydraulically operated knock-out frame operating along a track to receive each mold and eject parts from their cavities was successfully developed and enabled operation with the reduced number of press operators.

**"Plant Transportation"** was discussed by P. W. Watt, of The B. F. Goodrich Co. Mr. Watt, who has charge of the transportation department for the Goodrich Akron plants, pointed out that a separate department was established in 1917, which, today, has approximately 175 employes engaged exclusively in transporting inter-plant materials and finished products within the plants. Manufacturing operations require more than 10,000 separate materials of many types and sizes to be transported in multi-level factories with limited elevator and floor-loading capacities.

With increasing emphasis on speedy movement of materials at lowest possible cost, the department now has 80 industrial trucks of various types, 25,000 skid boards, 8,000 pallets, and 200 trailers, in addition to numerous other pieces of miscellaneous equipment.

Electric trucks are used for movement of most of the materials because of their low maintenance cost, long life, and dependability. Gas trucks have been found to give better performance for unloading palletized pigments and synthetic rubber and are necessary in locations where their pneumatic tires are less damaging to floors than electric trucks which are not so equipped.

The transportation department has its own maintenance mechanics for not only the industrial trucks, but for yard cranes, bulldozers, Diesel engines and for battery charging maintenance and repair facilities for the electric trucks.

To insure loaded operation for maximum periods for its industrial trucks, a central dispatching system was installed. At a central point, dispatching operators receive telephone requests for trucking service, which are relayed by telautograph to one of the three field dispatching stations, and to the first available truck operator.

The basic material movement plan consists of two separate, but coordinated parts: (1) a simple written order system for material movements; (2) time standard charts covering all possible trucking moves from department to department.

Handling costs are charged directly to the department shipping the material, and department heads can sometimes uncover potential savings when they suspect costs in certain instances may be too high by devising changes in location of stockrooms, installing bridges or ramps, and studying skid-load sizes and methods of loading.

The suitability of equipment in use is continually under examination by the transportation department, and when equipment must be replaced, there is careful consideration of several other factors than operating characteristics.

Plant transportation is an important factor in the end costs of products, justifying intensified study for increased efficiency, this speaker concluded.

The **"Automated Curing Room,"** was the subject of the talk by L. E. Soderquist, McNeil Machine & Engineering Co. Automatic and semi-automatic handling of passenger-car tires to and away from McNeil's Bag-O-Matic presses is a relatively new development; the first installation was made about three years ago. In addition to the labor savings that result from such installations, 15 to 25% more production is obtained from the presses, it was said. There are 32 separate installations for semi- or completely automatic handling of tires to and from the presses in North America today.

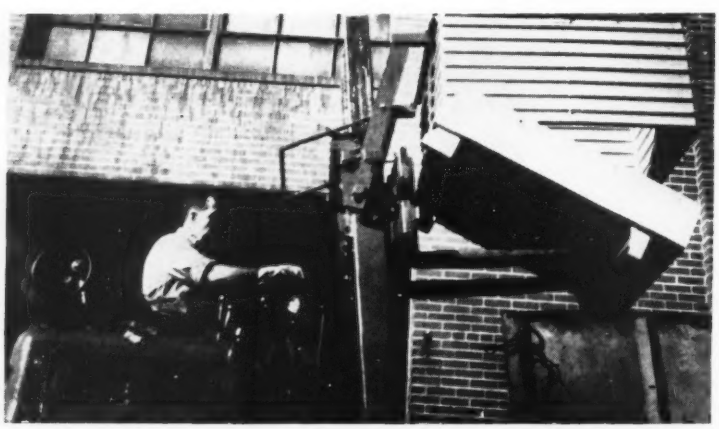

Fig. 3. Monarch Rubber's dump box and special lift truck mast attachment

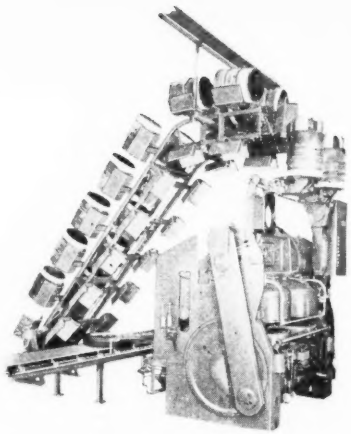

Fig. 4. McNeil's rear loading and takeaway conveyor for Bag-O-Matic tire press

Three distinct types of installations have been developed to meet the needs of various tire manufacturers, since no standard technique is applicable to the whole tire industry. The first type of semi-automatic operation employs either the vertical chuck loader or the pan loader, and an operator is required to place the uncured tires either on the chuck table or in the pan in front of the press. Regardless of the type of equipment used to supply the press with uncured tires, the cured tires are expelled from the rear of the press on to a flat belt conveyor which automatically carries them to trimming and final inspection. This semi-automatic installation will give the same production increase as the fully automatic installation. It is recommended where many sizes of tires are cured on the same equipment, and a suitable conveyor system for carrying the various sizes of tires to the operator so that he can keep a stockpile of uncured tires ahead of each press, is essential.

The second type of installation is called the "coal loader" because of the similarity. An operator is still required, but instead of servicing each mold position in the press with two tires, he services a loader which will carry from 6 to 10 tires, depending on the type of installation. Loading may be either front or back on to press loading chucks. More capital investment and more floor space are required, but this type of installation will handle tires of various sizes, and the operator is involved in less handling of the uncured tires. Figure 4 illustrates a rear loading installation over the takeaway conveyor.

The third or fully automatic type of installation is called the "shuttle pan loader" and is recommended for curing large quantities of tires for reasonably long runs. Each mold position on the press is equipped with a horizontal loading chuck, and in front of each chuck is a shuttle pan which receives uncured tires from a conveyor. The pan shuttles the uncured tire on to the loading chucks as the chucks set up a demand for a tire. Clam-shell or scissor-type service conveyors operate so that the uncured tire is dropped directly downward. Tires come from the building machines, each size on a separate belt conveyor, and are carried to an automatic sorting station. The press servicing conveyors run continuously on a chain conveyor, and each clam-shell is equipped with an adjustable flag or indexing system so that it will select only the size tire for which it is adjusted.

From the loading station the conveyor travels to the curing room where it passes down each row of presses in the room. At each mold position there is a selector which is so arranged that only the right-size tire can drop the shuttle pan in front of the press; and as long as an uncured tire remains in the pan, no other uncured tire will drop in that position. After the tire is cured it is discharged from the rear of the press and carried by belt conveyor to final inspection.

McNeil is working on an automatic card-type system which the company hopes will make it possible to handle tires in a completely automatic manner from the building machine to the warehouse.

Mr. Soderquist explained that there were also some semi-automatic installations in operation in connection with the curing of truck tires. The pan loader-type system is used.

Post inflation of tires is also handled automatically with the post inflators installed at the rear of the press so that after curing the tire is post inflated before being discharged onto the take-away conveyor.

A movie of the operation of an installation in which the inclined loader at the rear of the press carries the uncured tire over the take-away belt and press on to a loading chuck was shown at the conclusion of this talk.

**"The Role of Rubber in Materials Handling"** was the subject of the paper by J. L. Hawley, of Goodyear. Three specific rubber products and their use in materials handling were discussed: namely, conveyor belts, pillow tanks, and Rolli-Tankers; the last is Goodyear's name for a large tire filled with a fluid where the fluid is payload and the tire serves the dual purpose of container and running gear (Figure 5).

The growth and the wide usage of conveyor belts are a direct result of their proven capacity to move a great range of bulk materials at a lower cost than any other method of transportation. All of these applications depend to a very large extent on the currently available synthetic rubbers and fibers, without which each one of these uses would be severely restricted or possibly eliminated.

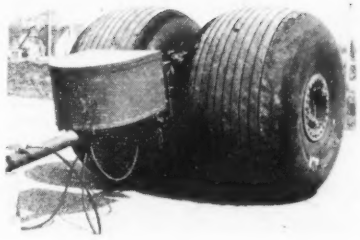

Fig. 5. Goodyear's "Rolli-Tankers" of 500-gallon capacity each

Mr. Hawley mentioned the continuing interest in the Riverlake Conveyor System[2] proposed several years ago for moving iron ore from Lake Erie to the Ohio River and coal from the river to the lake on the return trip, as evidence of the future applications of conveyor belts of unusual and more or less spectacular dimensions.

Pillow tanks have been developed in a range of sizes, that is 900, 3,000, and 10,000 gallons, and their acceptance by the Armed Forces has widened to the point where they are an ever-increasing part in future planning. Currently, the Army and Marine Corps are purchasing a considerable number of pillow tanks for fuel handling systems where portability and quick installation are of paramount importance.

These tanks are constructed in either single or two-ply configurations of nitrile rubber coated, square-woven cloth and usually include a nylon barrier between plies or, in the case of a single-ply tank, between laminations of the coating. The fittings for filling and emptying are achieved with metal inserts molded into a configuration providing tapered flanges for bonding to the basic tank material.

Large pillow tanks are at the moment of most interest to military organizations, but could be of interest to private industry. Transport pillow tanks have even greater commercial than military interest, but certain legal difficulties in connection with truck line charters and the Interstate Commerce Commission will have to be worked out before technical development is carried to completion.

Rolli-Tankers are the newest and least developed of the rubber products intended for materials handling and presented more difficult technical problems to solve than the pillow tanks since, in addition to containing fuel, the ability to withstand the abuses associated with tires such as repeated flexure and shock loads is required. The unit now in production has demonstrated the following capabilities: (1) It will follow any towing vehicle anywhere, and since it floats fully loaded with fuel,-this includes boats. (2) It may be transported by air and dropped from planes. (3) It has excellent self-sealing characteristics under small arms fire and will handle any of the common hydrocarbon fuels without gum contamination beyond specification limits.

The units used by the Army as Rolling Fluid Transporters consist of two 500-gallon-capacity Rolli-Tankers assembled on either side of a tow bar mounted just above the center of the common axle on which the tires are mounted. The tires are 64 inches in diameter, 42 inches maximum width, and have a bead diameter of 18 inches. The completed assembly weighs less than 2,300 pounds and includes the necessary equipment for filling, dispensing, and transfer of fuel. Operating pressures vary, depending on the type of terrain being traversed, ranging from a low of 2 psi to a high of 15 psi.

Present planning is for a family of these units in varying sizes in addition to the 1,000-gallon T-3 unit going into service and includes a 600-gallon unit and an improved version of the present 1,000-gallon unit.

[2] RUBBER WORLD, Mar., 1949, p. 740; May, 1956, p. 232.

## Boston RG Goes Skiing

The annual ski outing of the Boston Rubber Group was held at the Bartlett Inn, Bartlett, N. H., February 5-7, with 97 members, guests, and sons of members in attendance who enjoyed excellent winter sports conditions.

Organized by the outing chairman, James J. Breen, Barrett & Breen Co., and chairman of the Group, the program included skiing at Black Mountain, Cranmore Mountain, Thorn Mountain, and the new Wildcat Trail development in Pinkham Notch. Expert ski instruction was provided for novice skiers by Norman Torgerson, a qualified amateur ski instructor.

On Saturday evening the Group enjoyed Olympic Ski Team movies of trials on Wildcat expert trails, featuring Penny Pitou, and shown at the nearby Glen, N. H., Town Hall. Across the street from the inn nightly skating took place in the municipal skating area. The snowfall of several inches on Saturday night added to the adequate snow cover in the area, making conditions excellent for the entire weekend.

Indoor sports included the usual card parties and singing, and the refreshment bill was taken care of by the suppliers present, as in the past. No injuries were reported. One of the guests, a foreign student at Harvard, expressed surprise at the large number of winter sports enthusiasts in the area, as he expected most skiing was done in the Far West or in Europe.

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The subcommittee voted to recommend that D 1081-58T, Specification for Evaluating Pressure-Sealing Properties of Rubber and Rubber-Like Materials, be submitted to D-11 for letter-ballot and, if approved, be advanced to standard.

The subcommittee approved plans to investigate the need of a suitable test method for determining the suitability of elastomers exposed to liquids and gases under high-temperature service

conditions as requested in a letter from C. K. Chatten, New York Naval Shipyard. The immediate concern is for O-rings exposed to jet fuels at temperatures of 300 to 500° F.

Discussion was held on the draft of ISO/TC 45 Document 497, "Draft Proposal for Natural Rubber Rings for Joints in Water Piping." Comments made in this meeting as well as those submitted by other members will be compiled and prepared by the rubber ring task group.

**Subcommittee 8—Nomenclature. R. G. Seaman,** RUBBER WORLD, chairman. The names of 11 new subcommittee members were read. Their names were suggested to the chairmen of task groups 1 and 2 for addition to the rosters of these groups.

The five negative votes on item 16 of the August, 1959, Committee D-11 letter-ballot, the revised definitions for "rubber-like, rubber, and rubber products," were considered by the subcommittee. Some of the negative votes were resolved, but others could not be resolved. By unanimous vote it was decided to refer the definitions back to task group 1 for further work.

Task group 1 was also instructed to develop a test program among several laboratories and obtain extension-retraction data on rubber and rubber-like materials for comparison with the specifications outlined in items 2A and 2B of the August, 1959, letter-ballot as well as revised values as proposed by Polymer Corp., Ltd., and by B. S. Garvey, Jr., Pennsalt Chemicals Corp. The task group will further attempt to revise the definitions for rubber and rubber-like materials, using the results of these tests.

The activities of task group 2 on the further development of D 1418-58T, Tentative Recommended Practice for Nomenclature for Synthetic Elastomers and Latices, is dependent on resolving the conflict of this specification with D 1600-58T, Tentative Abbreviations of Terms Relating to Plastics; the latter is under the jurisdiction of Committee D-20 on Plastics. A meeting to resolve certain areas of conflict between Committee D-11 and D-20 including these nomenclature methods will be held in ASTM headquarters at some future date with officers of the committees, subcommittee chairmen, and others concerned in attendance. If and when the conflict is resolved, task group 2 will resume work on D 1418 and develop definitions and abbreviations for other families of elastomers starting with the polymethylene or "M" family.

R. D. Stiehler, National Bureau of Standards, chairman of task group 2, suggested the use of the glass transition temperature for separating rubber and rubber-like materials from plastics, in a letter of August, 1959, and proposed definitions for rubber, rubber-like, and plastic materials based on this glass transition temperature at this meeting. This idea will be presented and discussed at the D-11/D-20 conflict of interest meeting this spring and, if adopted, will be incorporated into subcommittee 8 definitions.

**Subcommittee 9—Insulating Tape. W. H. Meade, Boston Edison Co.,** chairman. Discussion on a proposed specification for water-resisting rubber insulating tape produced several controversial points. It was decided that a task group be appointed to work out a satisfactory solution.

A reported difficulty by a large user of friction tape during cold weather led to a discussion of D 69-57T, Specifications for Friction Tape for General Use for Electrical Purposes. The discussion revolved about the desirability of including certain low-temperature tests in the specification. The action taken was to refer this matter to a task group for study also.

No action was taken on consideration of a specification for rubber-like insulating tape to match cable insulations already specified by subcommittee 5. The concensus of opinion was that this required more thought and should be tabled until the next meeting.

**Subcommittee 10—Physical Testing. L. V. Cooper, Firestone Tire & Rubber Co.,** chairman. It was announced that this subcommittee would now include subcommittee 17 on Hardness, Set and Creep, as a task group with W. King, Acushnet Process Co., chairman. It was also stated that any work on tear testing would be considered under the jurisdiction of this subcommittee. The work on testing O-rings has been transferred to subcommittee 6 on packings.

A discussion indicated the need of a test method for making stress-strain determinations at elevated temperatures. The chairman appointed a task group to make up a tentative specification. A task group was also appointed to write a method for the use of strain gage machines for stress-strain testing.

A request was received from ASTM-SAE Joint Technical Committee for Automotive Rubber (Tech "A") for a means to assign definite values for tear tests specified under suffix G of D 735-58T, Tentative Specification for Elastomer Compounds for Automotive Applications. This suggestion was not too enthusiastically received by the subcommittee. A task group was named to survey the opinion of the industry and recommend what action the subcommittee should take.

**Subcommittee 11—Chemical Analysis of Rubber Products. W. P. Tyler, Goodrich,** chairman. A proposed revision of D 297-55T, Chemical Analysis of Rubber Products, which incorporates D 833-46T, Methods of Identification and Quantitative Analysis of Synthetic Elastomers, was presented and discussed. The subcommitttee voted to recommend the revision for letter-ballot in Committee D-11.

Also recommended for D-11 letter-ballot was a proposed draft of a method for determining the solubility of solid rubber chemicals, which received no negative votes when letter-balloted in the subcommittee.

Results were announced of a testing program on the determination of IIR (butyl), titanium dioxide, and bound styrene in rubber products. The IIR determination results indicated rather poor reproducibility and accuracy. The titanium dioxide determination results were satisfactory, but not excellent. The method for determining bound styrene could not be made to give any meaningful results.

The methods for determining IIR and titanium dioxide will be incorporated in D 297-55T, but with proper warnings concerning reproducibility and accuracy. Further work will also be done on the methods to try and refine them.

An announcement was made that proper liaison arrangements would be made between subcommittees 11 and 12 since the latter is assuming responsibility for the analysis of crude natural rubber, and both subcommittees are interested in analysis proposals made by ISO/TC 45.

**Subcommittee 12—Crude Natural Rubber. L. G. Mason, Goodrich,** chair-

Head Table at Chicago D-11 Dinner

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H. Paul Miller, Cadillac, Inc., reported on the meeting of Committee C-13 on Concrete Pipe held in San Francisco, Calif., in October, 1959. He stated that the recommendations of subcommittee 6 had been well received and that the major points had been included as revisions in the rubber ring portion of specification C 443-59T.

The subcommittee voted to recommend that D 1081-58T, Specification for Evaluating Pressure-Sealing Properties of Rubber and Rubber-Like Materials, be submitted to D-11 for letter-ballot and, if approved, be advanced to standard.

The subcommittee approved plans to investigate the need of a suitable test method for determining the suitability of elastomers exposed to liquids and gases under high-temperature service

conditions as requested in a letter from C. K. Chatten, New York Naval Shipyard. The immediate concern is for O-rings exposed to jet fuels at temperatures of 300 to 500° F.

Discussion was held on the draft of ISO/TC 45 Document 497, "Draft Proposal for Natural Rubber Rings for Joints in Water Piping." Comments made in this meeting as well as those submitted by other members will be compiled and prepared by the rubber ring task group.

**Subcommittee 8—Nomenclature. R. G. Seaman,** RUBBER WORLD, chairman. The names of 11 new subcommittee members were read. Their names were suggested to the chairmen of task groups 1 and 2 for addition to the rosters of these groups.

The five negative votes on item 16 of the August, 1959, Committee D-11 letter-ballot, the revised definitions for "rubber-like, rubber, and rubber products," were considered by the subcommittee. Some of the negative votes were resolved, but others could not be resolved. By unanimous vote it was decided to refer the definitions back to task group 1 for further work.

Task group 1 was also instructed to develop a test program among several laboratories and obtain extension-retraction data on rubber and rubber-like materials for comparison with the specifications outlined in items 2A and 2B of the August, 1959, letter-ballot as well as revised values as proposed by Polymer Corp., Ltd., and by B. S. Garvey, Jr., Pennsalt Chemicals Corp. The task group will further attempt to revise the definitions for rubber and rubber-like materials, using the results of these tests.

The activities of task group 2 on the further development of D 1418-58T, Tentative Recommended Practice for Nomenclature for Synthetic Elastomers and Latices, is dependent on resolving the conflict of this specification with D 1600-58T, Tentative Abbreviations of Terms Relating to Plastics; the latter is under the jurisdiction of Committee D-20 on Plastics. A meeting to resolve certain areas of conflict between Committee D-11 and D-20 including these nomenclature methods will be held in ASTM headquarters at some future date with officers of the committees, subcommittee chairmen, and others concerned in attendance. If and when the conflict is resolved, task group 2 will resume work on D 1418 and develop definitions and abbreviations for other families of elastomers starting with the polymethylene or "M" family.

R. D. Stiehler, National Bureau of Standards, chairman of task group 2, suggested the use of the glass transition temperature for separating rubber and rubber-like materials from plastics, in a letter of August, 1959, and proposed definitions for rubber, rubber-like, and plastic materials based on this glass transition temperature at this meeting. This idea will be presented and discussed at the D-11/D-20 conflict of interest meeting this spring and, if adopted, will be incorporated into subcommittee 8 definitions.

**Subcommittee 9—Insulating Tape. W. H. Meade, Boston Edison Co.,** chairman. Discussion on a proposed specification for water-resisting rubber insulating tape produced several controversial points. It was decided that a task group be appointed to work out a satisfactory solution.

A reported difficulty by a large user of friction tape during cold weather led to a discussion of D 69-57T, Specifications for Friction Tape for General Use for Electrical Purposes. The discussion revolved about the desirability of including certain low-temperature tests in the specification. The action taken was to refer this matter to a task group for study also.

No action was taken on consideration of a specification for rubber-like insulating tape to match cable insulations already specified by subcommittee 5. The concensus of opinion was that this required more thought and should be tabled until the next meeting.

**Subcommittee 10—Physical Testing. L. V. Cooper, Firestone Tire & Rubber Co.,** chairman. It was announced that this subcommittee would now include subcommittee 17 on Hardness, Set and Creep, as a task group with W. King, Acushnet Process Co., chairman. It was also stated that any work on tear testing would be considered under the jurisdiction of this subcommittee. The work on testing O-rings has been transferred to subcommittee 6 on packings.

A discussion indicated the need of a test method for making stress-strain determinations at elevated temperatures. The chairman appointed a task group to make up a tentative specification. A task group was also appointed to write a method for the use of strain gage machines for stress-strain testing.

A request was received from ASTM-SAE Joint Technical Committee for Automotive Rubber (Tech "A") for a means to assign definite values for tear tests specified under suffix G of D 735-58T, Tentative Specification for Elastomer Compounds for Automotive Applications. This suggestion was not too enthusiastically received by the subcommittee. A task group was named to survey the opinion of the industry and recommend what action the subcommittee should take.

**Subcommittee 11—Chemical Analysis of Rubber Products. W. P. Tyler, Goodrich,** chairman. A proposed revision of D 297-55T, Chemical Analysis of Rubber Products, which incorporates D 833-46T, Methods of Identification and Quantitative Analysis of Synthetic Elastomers, was presented and discussed. The subcommitttee voted to recommend the revision for letter-ballot in Committee D-11.

Also recommended for D-11 letter-ballot was a proposed draft of a method for determining the solubility of solid rubber chemicals, which received no negative votes when letter-balloted in the subcommittee.

Results were announced of a testing program on the determination of IIR (butyl), titanium dioxide, and bound styrene in rubber products. The IIR determination results indicated rather poor reproducibility and accuracy. The titanium dioxide determination results were satisfactory, but not excellent. The method for determining bound styrene could not be made to give any meaningful results.

The methods for determining IIR and titanium dioxide will be incorporated in D 297-55T, but with proper warnings concerning reproducibility and accuracy. Further work will also be done on the methods to try and refine them.

An announcement was made that proper liaison arrangements would be made between subcommittees 11 and 12 since the latter is assuming responsibility for the analysis of crude natural rubber, and both subcommittees are interested in analysis proposals made by ISO/TC 45.

**Subcommittee 12—Crude Natural Rubber. L. G. Mason, Goodrich,** chair-

Head Table at Chicago D-11 Dinner

man. Announcement was made by R. D. Stiehler that members of this subcommittee would cooperate with ISO-TC 45 in testing lots of seven commercial grades of natural rubber plus the NBS standard sample 385. The seven grades will be prepared by the Firestone Plantations Co. Tests will be run by laboratories throughout the world. Six companies in the United States have indicated a desire to be among the 25 participating laboratories. Any others wishing to participate should so advise Dr. Stiehler. Present hopes are that the program will be concluded in time to be reported at the ISO/TC 45 meeting in Milan, Italy, in 1961.

Reports of rubber high in impurities were made by Dr. Stiehler and by D. D. Wright, Goodrich Footwear & Flooring. The NBS reported several lots of fresh imported smoked sheets for GSA had been found high in iron and above the 0.001% maximum on manganese, and one lot was found above the 0.08% RMA specification maximum on copper. The Goodrich report stated that a lot of #1X Thin Brown rubber containing 0.0037% copper had been received and showed a bad heat condition with numerous tacky, melted heat spots. Goodrich also reported a number of instances of high manganese in #3 and #4 Ambers and a shipment of Flat Bark.

The conclusion was drawn that consumers should be running more check tests on copper and manganese and perhaps even iron. All off-specification lots should be reported to the Rubber Research Institute of Malaya and the producers involved for corrective action. Samples of the bad materials should be sent also to both parties.

The chairman reported that a phone call had been received from H. C. Bugbee, president of the Natural Rubber Bureau, prior to the meeting announcing the appointment of Ralph F. Wolf as Director of Technical Service for the Bureau. It was also noted that a new Estates Advisory Service had been established in Malaya to give advice on cultivation and crop production. The chairman indicated that these services should be well received and hoped that they would result in improved output and quality of natural rubber.

Until such time as ISO/TC 45 chemical test procedures are reviewed, and the present round-robin testing of NBS Standard Bale 385 is complete, it was felt that D 1278-58T, Test for Chemical Analysis of Natural Rubber, should remain as a tentative.

The task group working on D 1278 will also strive to establish the suitability of the nitrogen and acetone extract procedures now in D 297-55T for use on crude natural rubber and report the results at the June, 1960, meeting.

During further discussion it was pointed out that the copper, manganese, and iron procedures of D 1278 should be tried on samples high in these impurities since the NBS standard used in previous tests is very low in these materials. The possibility of using X-ray spectroscopy (X-ray fluorescence) for making fast, accurate copper and manganese determinations will also be investigated.

The special natural rubber described by J. LeBras at the meeting in Washington, D. C., on November 9 has not yet been received, but anyone interested in testing it should notify the chairman.

The proposed revised limits for #1 and #1X smoked sheet and pale crepe rubbers given at the Washington meeting were discussed briefly, but will be held in abeyance pending checking of lots for conformance.

**Subcommittee 13—B. S. Garvey, Jr., Pennsalt Chemicals,** chairman. Task group 1 reported on an industry survey of producers of black masterbatch on testing for volatile matter and moisture. Shell Chemical Co. suggested a method giving an accuracy of ±1%. After much discussion on the need of such accuracy it was agreed that this method would be considered by the group, but that D 1485-57T, Methods for Sampling and Sample Preparation of Synthetic Elastomers (Solid Styrene-Butadiene Copolymers), would continue as the tentative method for preparing samples for testing for moisture and volatile matter until the various features of the different methods are resolved.

Task group 2 reported that there were two negative votes on the subcommittee 13 letter-ballet on method of estimating the oil content of an oil or oil-black masterbatch. Not being able to resolve the negative votes, the meeting voted to refer the method back to the task group for further clarification of wording and additional cross-checks if necessary.

This task group will also check samples of polymers for color, using the APHA (American Public Health Association) method. Samples will be provided by Shell Chemical Co. and distributed by the group chairman.

In discussion of work of task group 3 on physical tests it was pointed out that Table II of D 1419-58T, Recommended Practice for Description of Types of Styrene-Butadiene Rubbers (SBR), is inconsistent in that the oil content of a masterbatch is designated as parts per hundred of rubber (PHR), while the black content is designated as % of the total of the rubber, black, and oil. A motion was passed unanimously to revise D 1419-58T so that the black content will also be designated in parts per hundred of rubber (PHR).

A motion was also passed to submit for final confirmation the assignment of SBR numbers 1509, 1606, 1806, 1807, and another polymer received, but not yet numerically designated. These will be submitted to Committee D-11 by letter-ballot for confirmation.

The results of the subcommittee 13 letter-ballot on the use of 40 parts of HAF carbon black in place of the 40 parts of EPC channel black in the SBR standard test formulas in D 15-58T, Methods of Sample Preparation for Physical Testing of Rubber Products, were reported. This revised recipe was found to be unsuitable. Three laboratories are now obtaining results on 50 parts of HAF black per hundred of rubber with varying amounts of MBTS before submitting formulas. These cross-check tests will be run on SBR 1500, 1502, 1712, and 1713. Phillips Chemical Co. has agreed to blend sufficient amounts of these polymers so that each of the participating laboratories may receive uniform samples of the four rubbers. These samples will be sent out in March.

The chairman reported that extensive studies of the task group on classification and description of extender oils or process oils had lead to the recommendation for an appendix to D 1419-58T on SBR descriptions. A motion was passed to submit the following to subcommittee 13 by letter-ballot for approval as an appendix to D 1419: (a) in Table II, the various oils used in oil masterbatches are described as paraffinic, naphthenic, aromatic, and highly aromatic. These descriptions of these types of oil are satisfactory for the purpose of Table II, but are not adequate as purchase specifications for these oils; (b) for any oil to be classified as an extender oil for use in SBR-oil masterbatches, it must be shown to give masterbatches satisfactory both to producers and consumers of such oil masterbatches; and (c) oils which have been demonstrated to be satisfactory extender oils may be further classified as to chemical types according to Table III. (The contents of Table III which would be added to D 1419 were not fully disclosed at the meeting, but will be part of the official minutes and letter-ballot circulated to subcommittee 13 membership.)

A motion was passed to recommend to Committee D-11 that D 1417-57T, Methods for Testing Synthetic Rubber Latices (Styrene-Butadiene Copolymers), be letter-balloted for advancement to standard.

A motion was also passed to transfer jurisdiction of D 1418-58T, Recommended Practice for Nomenclature for Synthetic Elastomers and Latices, to subcommittee 8 on Nomenclature.

**Subcommittee 15—Life Tests for Rubber Products. G. C. Maassen, R. T. Vanderbilt Co.,** chairman. The task group on "Correlation of Oven and Shelf Aging" reported that the results of the 12-year shelf-aging tests are now

## Ameripol Rubber puts luxury look in practical product

Rubber floor tile is the "practical" flooring.
It's well known for durability, ease of maintenance and modest cost
For these qualities almost any good synthetic rubber will do.

But Ameripol polymer 1502 enables the Armstrong Cork Company to produce rubber tile in striking beauty and color—color that won't stain, or fade in the sunlight. Because Ameripol 1502 is so consistently light and uniform, Armstrong can easily duplicate colors from production run to production run.

When you want to make a good rubber product *better*, there's particular reason for calling in Goodrich-Gulf. From production research and quality control, to technical service and warehousing, we're organized to meet your specific requirements.

For more information contact Goodrich-Gulf Chemicals, Inc., 1717 East Ninth Street, Cleveland 14, Ohio.

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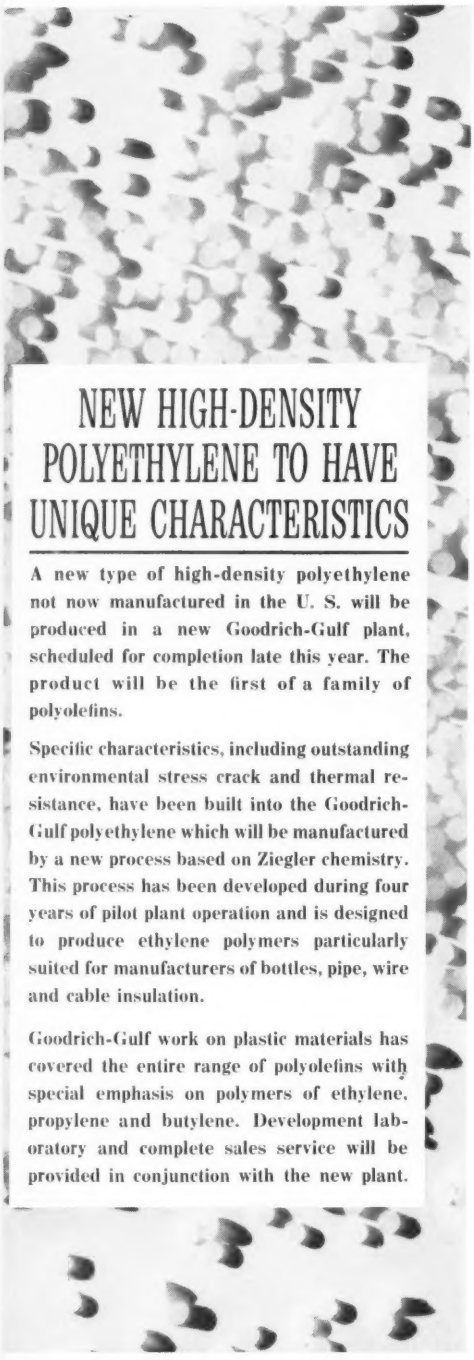
# NEWS FROM GOODRICH-GULF



## NEW HIGH-DENSITY POLYETHYLENE TO HAVE UNIQUE CHARACTERISTICS

**A new type of high-density polyethylene not now manufactured in the U. S. will be produced in a new Goodrich-Gulf plant, scheduled for completion late this year. The product will be the first of a family of polyolefins.**

**Specific characteristics, including outstanding environmental stress crack and thermal resistance, have been built into the Goodrich-Gulf polyethylene which will be manufactured by a new process based on Ziegler chemistry. This process has been developed during four years of pilot plant operation and is designed to produce ethylene polymers particularly suited for manufacturers of bottles, pipe, wire and cable insulation.**

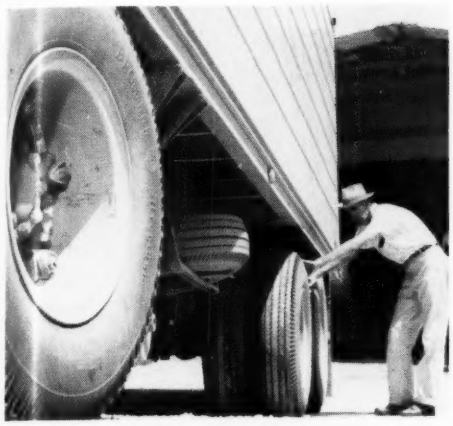
**Goodrich-Gulf work on plastic materials has covered the entire range of polyolefins with special emphasis on polymers of ethylene, propylene and butylene. Development laboratory and complete sales service will be provided in conjunction with the new plant.**

## NEW AMERIPOL 4600 IS EASIER PROCESSING RUBBER

A new, fatty acid emulsified, cold type styrene-butadiene copolymer is now available from Goodrich-Gulf. Called Ameripol 4600, the announcement of its development is being made after a year of extensive field testing, which indicates that it will be ideal for use in shoe soles, floor tile, sponge, white sidewalls, sport shoes and household goods.

Ameripol 4600 is similar to 1502 type polymer except a fatty acid emulsifier is used instead of mixed fatty acid rosin soaps. However, 4600 has some distinct advantages: its Mooney is in the 36-48 range rather than 46-58 and it is lighter in color.

The new polymer was produced primarily to provide rubber processors with an easier processing rubber exhibiting a faster cure rate, higher modulus, and less tack than 1502. With lower viscosity, the polymer can be broken down in drastically less time than usual. The reduced Mooney range also provides less power consumption at the processor's plant. The hardness of 4600 is slightly higher than 1502 for a given cure time.



## LOOK AHEAD-NEW SYNTHETIC RUBBERS FOR TRUCK, AIRCRAFT, HEAVY VEHICLE TIRES

Advanced engineering work is underway at Goodrich-Gulf leading toward commercial production of two new synthetic rubbers, Ameripol SN rubber (polyisoprene) discovered by the company in 1954, and Ameripol CB (cis-polybutadiene) rubber, an equally important development.

Ameripol SN, the first man-made rubber having the same molecular structure as natural tree rubber, was first announced by Goodrich-Gulf in 1954. It possesses the physical properties of tree rubber even to tack and stickiness. Pilot plant operation has produced five distinct types in tonnage quantities for large scale testing. This program has demonstrated that Ameripol SN can be substituted pound for pound for natural rubber in the manufacture of truck, bus, aircraft, military, and off-the-road tires.

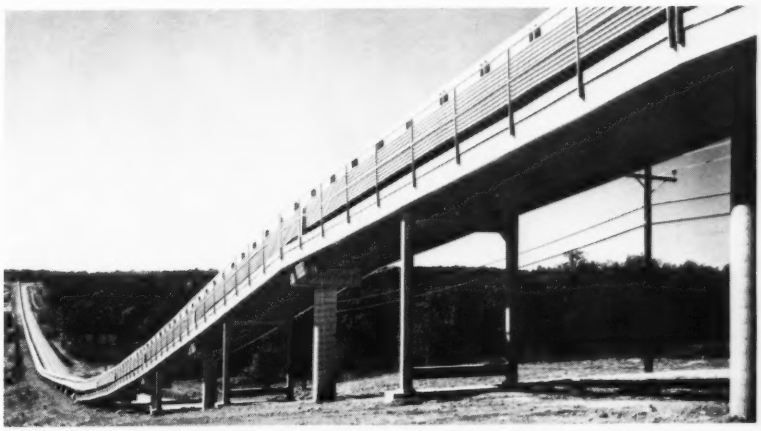
Ameripol CB rubber has excellent characteristics for minimizing heat build-up, which is a prime cause of the destruction of truck tires and other products. It is a stronger, tougher rubber at high temperatures than any other general purpose synthetic rubber now available.

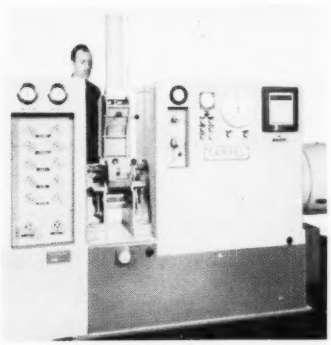
When these new rubbers are available, it is anticipated that manufacturers of heavy-duty tires can reduce their dependence on tree rubber by 50 to 100 per cent. In addition to attractive physical properties, these new man-made rubbers will offer the major advantages of price stability and a source of supply completely independent of far eastern sources.

## CONVEYOR USES WORLD'S LONGEST RUBBER BELT

Ameripol rubber is used in eleven miles of conveyor belting for this limestone and shale conveyor system—including a single flight of belting measuring nearly 12,000 feet, longest ever built. Long length belts help reduce maintenance, labor and equipment costs.

Ameripol is a preferred rubber for the blend used for belting material. It contributes good aging properties, and resistance to wear and weathering.





## SALES SERVICE LABORATORY EXPANDS FACILITIES

This Banbury® Mixer at the Goodrich-Gulf Service Laboratory is typical of a full range of processing equipment which helps us duplicate customer factory operations. Thus, problems can be analyzed thoroughly and sound technical recommendations for different recipes, processing methods, etc., can be made. Laboratory services, when you need them, are available through Goodrich-Gulf Technical Service.

If you want additional information on any of these items, or would like to be on the Goodrich-Gulf technical release mailing list, please write Goodrich-Gulf Chemicals, Inc., 1717 East Ninth Street, Cleveland 14, Ohio.

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# SELECTION GUIDE TO AMERIPOL

*The broadest line of Styrene-Butadiene Rubber Polymers*

## NON-PIGMENTED RUBBER

### HOT RUBBERS

| Ameripol No. | Antioxidant | Characteristics |
|---|---|---|
| 1000 | Staining | General purpose rubber, easy processing, good aging, for wide range of molded and extruded products. |
| 1001 | Slightly staining | General purpose rubber, similar to Ameripol 1000, used where less discoloration is required. |
| 1002 | Staining | Similar to Ameripol 1000, exhibits more tack in processing. |
| 1006* | Non-staining | General purpose rubber for light colored and white products. |
| 1007 | Staining | Good electrical resistance properties. Reduced water absorption. |
| 1009* | Non-staining | Has little or no nerve in milling, used as a processing aid in other rubbers. |
| 1011 | Non-staining | Tackier in processing than Ameripol 1006, used in adhesives, tapes, molded and extruded goods. |
| 1012* | Non-staining | Excellent flow characteristics and high green strength in compounded stocks. Used to increase tensile and hardness in non-black stocks. |

*Available in either bale or crumb form.

### COLD RUBBERS

| Ameripol No. | Antioxidant | Characteristics |
|---|---|---|
| 1500 | Staining | General purpose cold rubber, better physicals, usually better processing than hot rubbers. |
| 1501 | Slightly staining | Similar to 1500, better resistance to staining and discoloring. |
| 1502 | Non-staining | General purpose rubber for light colored and white products. |
| 4600 | Non-staining | For light colored and white products. Good physicals on aging. Fast pigment incorporation. Reduced Mooney viscosity. |

### OIL-EXTENDED RUBBERS

| Ameripol No. | Antioxidant | Characteristics |
|---|---|---|
| 1703 | Non-staining | General purpose 25-part naphthenic oil-extended polymer. |
| 1705 | Staining | General purpose 25-part aromatic oil-extended, improved processing and aging. |
| 1707 | Non-staining | General purpose where higher oil, 37½-part, can be used. |
| 1708 | Non-staining | 37½-part oil-extended, highly resistant to discoloration and stain. |
| 1710 | Staining | Similar to 1705, higher oil level. Easy processing, excellent physicals at lower cost. |
| 1712 | Staining | 37½-part oil-extended, superior processing. |
| 4700 | Non-staining | 50-part oil-extended, for greatest economy. |

## MICRO-BLACK MASTERBATCH

### COLD, OIL-EXTENDED TYPES

| Ameripol No. | Antioxidant | Characteristics |
|---|---|---|
| 4760 | Non-staining | 75 parts SRF black and 17.5 N oil. |
| 4751 | Non-staining | An easy processing polymer with 100 parts FEF black and 50 parts N oil. Applications are low cost extrusion and molded goods. |
| 1805 | Non-staining | A low cost tread rubber of 75 parts HAF black and 37.5 parts N oil. |
| 4750 | Staining | 75 parts HAF black and 37.5 HA oil. Applications include tires, camelback and mechanical goods. |
| 4753 | Staining | This 75 parts HAF black and 50 parts HA oil polymer is very suitable for camelback and low cost molded and extruded goods. |
| 4759 | Staining | 75 parts ISAF black and 37.5 parts A oil. Applications include high quality camelback and tires. |
| 4761 | Staining | 65 parts SAF black and 37.5 parts A oil. Especially suitable where superior abrasion resistance is needed. |

### COLD TYPES

| Ameripol No. | Antioxidant | Characteristics |
|---|---|---|
| 1605 | Non-staining | Easy processing extrusion polymer with 50 parts of FEF black also suitable for manufacture of high quality molded goods. |
| 4659 | Staining | 52 parts of HAF black and 10 parts of HA oil. Used successfully for retreading. |
| 4651 | Staining | 62.5 parts of HAF black and 12 parts of HP oil. Used in camelback tires and mechanical goods. |
| 4660 | Staining | 52 parts ISAF black and 10 parts HA oil. High abrasion resistance suitable for tires camelback. |

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complete. Committee D-11 will be asked to have the data statistically evaluated.

Another task group studying the "Staining Tendencies of Carbon Black" reported that the first problem was development of a method for measurement of the color of a rubber product. Further work is to be done to determine minimum significant color differences, and to compare results obtained in various instruments and by visual observation.

The fading of the plastic color chip used to calibrate intensity of light source progresses in a straight-line function according to the report of the task group on "weathering" presented to the subcommittee. It was further reported that this plastic color chip method was of interest to Committee D-20 on Plastics also and that that committee would probably letter-ballot on its use after its meeting in March. There is now no standard source for these color chips, and it is hoped that the National Bureau of Standards will prepare them when the method is adopted as standard.

The "ozone testing" task group reported that several suggestions had been made on the subcommittee letter-ballot for revisions of D 1149-55T, Test for Accelerated Ozone Cracking of Vulcanized Rubber. As a result of these suggestions, a new tentative method was drawn up by the task group incorporating the method proposed by SAE-ASTM Tech "A." A motion was passed that this new tentative method be recommended to Committee D-11 for submission to letter-ballot for replacement of the present D 1149. The necessary contact with Tech "A" will be made to resolve any possible conflicts.

Results of tests in the "Royen Tube Oven" (developed at Apex Tire) were reported by the task group on "oven aging." These results indicate that this oven appears to be a most promising solution to the problem of obtaining improved uniformity and reproducibility of oven-aging test results. Since most of the data have been obtained from one set of ovens, it is necessary to correlate results from several others to determine the extent of such uniformity on a broader basis. Six companies have agreed to cooperate in a round-robin test program, the results of which should be available at the June, 1960, meeting.

**Subcommittee 16—Classification and Specifications of Rubber Compounds. J. F. Kerscher, Goodyear Tire & Rubber Co.,** chairman. The chairman opened discussion of the paper by Catton, Edwards, and Loring on "A Practical Method of Classifying All Elastomeric Vulcanizates," which was presented before the International Rubber Conference in Washington, D. C., in November, 1959. The method was described as representing the present thinking in this country of how this classification should be set up. It was further stated that this subcommittee had struggled with the problem for some time and had finally joined with SAE-ASTM Tech "A" in work on this method. In discussion, some felt that the automotive industry might wield undue influence in values and changes or that the values originally set might not suit the belt, hose, or other segments of the rubber industry. It was pointed out that while Section IV-D-3 of Tech "A" would have prime responsibility for values, subcommittee 16 of ASTM would continue to have representation on that group.

Another question raised concerned the actual assigning of meaning to the letters of Tables I and II, with A being low value for oven aging and high value in oil swell resistance. No real answer was made to this question since none of the authors of the above mention paper were present, but the chairman noted it for further clarification.

Since the attending members seemed to be somewhat hesitant concerning the adoption of this new method, a motion was passed requesting that Committee D-11 circulate a reprint of the paper along with a questionnaire to accompany the next letter-ballot to allow all types of rubber manufacturing companies to register support or criticism.

The chairman also reported on Working Group 6 of ISO/TC 45 as to results of the meeting held in New York, N. Y., in October, 1959. He reported that the paper discussed above had been presented before that group, and as a result, no action was taken on two ISO documents (#445 and #446) to allow members to study this new system before any changes or new methods would be adopted.

**Subcommittee 17—Tests of Hardness, Set, and Creep. W. H. King, Acushnet Process Co.,** chairman. The meeting was opened with the observance of a moment of silence in memory of the past chairman, Sherman R. Doner, who passed away in August, 1959.

The subcommittee voted to recommend to D-11 that the following two tentatives be letter-balloted for advancement to standard: D 1390-56T, Test for Stress Relaxation of Vulcanized Rubber in Compression, and D 1415-56T, Test for International Standard Hardness of Vulcanized Natural and Synthetic Rubbers.

A comparison of cut *versus* molded test pieces for compression set tests was presented by the task group. There are variations in size of molded plugs and a taper effect in cut plugs as regards diameter. It was the opinion of the group present that this would not affect results in D 395-55, Method B, but would affect results in Method A. Thickness variations would be handled by using appropriate spacer bars. A formal report for publication will be prepared.

It was reported to the meeting that Shore Instrument & Mfg. Co., Inc., had a bulletin, R-16, describing the Shore Durocalibrator, an instrument for calibrating Shore durometers.

**Subcommittee 20—Adhesion Tests. H. H. Irvin, Marbon Chemical Division, Borg-Warner Corp.,** chairman. Minor differences between D 429-58T, Test for Adhesion of Vulcanized Rubber to Metal, and the ISO counterpart are to be studied further before any recommendations are made.

Three new adhesion tests also will be studied further. Two were introduced by the ISO, and the third by Lord. Mfg. Co. These methods will be further discussed at the June, 1960, meeting.

A proposed supplement to include measurement of standardized environmental effects on adhesion values was introduced, and copies were distributed to those present. It is hoped that comments will be made during the coming months so that the proposal can be recommended to D-11 for letter-ballot after discussion at the June meeting.

A task group was appointed with Henry Peters, Bell Telephone Laboratories, chairman to review the need of a wire adhesion test and possibilities of evolving such a test if needed. Additional members will be appointed to the task group as needed.

An invitation will be extended to A. L. Van Emden, Bureau of Ships, to attend the next meeting and discuss suggested changes to D 429 that were incorporated in report 5611-3 (New York Naval Shipyard Material Laboratory).

At the request of D-11 advisory committee, the scope, functions, and overlaps of subcommittees 20 and 21 will be further reviewed on an intra and inter subcommittee basis by the officers of these two subcommittees.

**Subcommittee 21—Testing of Rubber Cements and Related Products. J. F. Anderson, Goodrich,** chairman. Task group 2B on wire cord and bead wire reported correlation between wire pull-out tests conducted by Firestone, General Tire, and Goodyear, using Goodyear mold with Goodyear stock and using Firestone mold with Firestone stock. Results were significant and suggested further checking. The next series will be run by the same three companies plus National Standard Co., using Goodyear Stock and both Goodyear and National Standard molds. Tests are to be conducted at two and six inches per minute since these speeds represent maximum influence of speed on test results.

A test program will also be organized among a number of companies to

test the application of the "H" test by the wire group. This "H" test was the subject of a meeting on February 4, 1960, of task group 2A and is basically a test for adhesion of textile cord to rubber. The task group attempted to write a formal method for this "H" test and the method was reviewed and revised at that meeting with this idea in mind. Data showing significance of time lag on temperatures of testing were presented. Further work will be done and both task groups will meet again before the June meeting.

**Subcommittee 22—Cellular Rubbers. L. A. Wohler, Firestone,** chairman. It was reported that changes in D 1055-58aT, Specification and Method of Test for Latex Foam Rubbers; D 1056-58T, Specification and Method of Test for Sponge and Expanded Cellular Rubber Products; D 1564-58T, Test for Flexible Urethane Foam; and D 1565-58T, Specification and Methods of Test for Flexible Foams Made from Polymers or Copolymers of Vinyl Chloride, had been approved by letter-ballot and will be printed in the 1960 D-11 standard. It was further reported that SAE-ASTM Tech "A" had also approved the changes except for D 1564 where the two-point method for deforming urethane foam for seating will have to be further clarified before the method will be printed in the SAE Handbook.

Rock Island Arsenal reported that they were adopting the recommended ASTM nomenclature in its proposed "Military Standard for Cellular Elastomeric Materials," as suggested by ASTM and SAE committees.

As a result of many objections on the letter-ballots, it was decided that D 1692-59T, Test for Flammability of Plastics Foams and Sheeting, was not a suitable test for all flexible foams. A motion was passed that subcommittee 22 of D-11 go on record as opposed to the use of D 1692 for flexible foams, and that the title and the scope of that tentative should be changed so that rigid foams only would be covered. A task group was appointed to review and report on current status of all activity in the field of flammability.

The Flexible Vinyl Foam Committee of the Society of the Plastics Industry (SPI) has asked that D 1692 be made a part of D 1565-58T, Specification and Methods of Test for Flexible Foams Made from Polymers and Copolymers of Vinyl Chloride. Since this is basically a material with high flame resistance, the group felt that this request was justified, and the subcommittee will be letter-balloted for confirmation. Action will be taken at the June, 1960, meeting if the vote is favorable.

**Subcommittee 23—Hard Rubber. W. J. Dermody, Electric Storage Battery Co.,** chairman. Comments were received on letter-ballots concerning revision in D 530-57T, Methods of Testing Hard Rubber Products, and its effect as an included method in D 639-57T, Methods of Testing Asphalt Composition Battery Containers, that protested the wording in D 530 which seemed to exclude constant rate of strain testing machines from use in testing hard rubber. The meeting felt that this exclusion was not desirable and therefore voted to request authorization of D-11 to change editorially the wording of the current D 530 revision to include all machines meeting the standards of accuracy of the Society.

Task group 4 presented a system of hard rubber grades that rated hard rubber in seven grades (O, 1, 2, 3, 4, 5, 6), depending upon physical properties. Each grade was further specified as to values for various tests such as heat distortion, cold flow, flex strength, oil resistance, and a number of others. The meeting produced the opinion that every test method specified in D 530 should have a heading and values in this system, and that the range of values should be broadened, but at the same time the limits of each group within the range should be narrowed.

**Subcommittee 24—Rubber and Rubber-Like Coated Fabrics. K. L. Keene, United States Rubber Co.,** chairman. The task group on cold crack resistance reported on work in progress correlating six methods of testing being run on five types of coated fabrics. Test data will be reported in June, 1960.

A report was received that stated that bottled gas was satisfactory for use in testing flame resistance of coated fabrics since, at a given B.T.U. content, it gave results very similar to gas furnished for domestic consumption. Cost of installations, however, did not seem to be justified. Further investigation will be made and results announced in June.

The chairman was given permission by the group to advise the General Services Administration that subcommittee 24 had no objection to the cancellation of Federal Specification CCC-C-418, Cloth, Coated, Upholstery (Vinyl Resin).

It was announced that the request for work on gas permeability of rubber products had been forwarded to subcommittee 10.

The results of the subcommittee letter-ballot on a test to be called Tack Tear were announced. There were no negative votes; so the method was recommended to D-11 for letter-ballot for adoption as a new tentative method.

Returns from a questionnaire requesting information on the advisability of setting up a separate task group for testing coated fabrics for the automotive industry did not produce many replies indicating a willingness to accept work assignments. It was decided, therefore, to table this suggestion until such time as more interest is shown.

A proposal by Committee D-13 on Textile Materials to make some changes in fabric for rubber coating methods which will be letter-balloted in that committee will also be circulated to subcommittee 24 for information.

**Subcommittee 25—Low-Temperature Tests for Rubber and Rubber-Like Materials. R. S. Havenhill, St. Joseph Lead Co.,** chairman. R. E. Ofner, Rock Island Arsenal, reported that the ISO/TC 45 group working on low-temperature tests had voted to advance Document 389 on brittleness to a draft recommendation with minor changes. Document 387 on stiffness was held up with a recommendation that further work with gaseous and liquid media be done.

Blueprints showing details of the ball thrust method for velocity determination of the Scott Tester Solenoid-type brittleness tester were circulated.

The chairman was authorized to advise Committee D-20 that round-robin data showed good agreement between solenoid and gravity actuated brittleness equipment and to request that D 746-57T, Test for Brittleness Temperature of Plastics and Elastomers by Impact, be modified to include gravity actuation.

This group was also advised of the work on coated-fabric cold crack test as described in subcommittee 24 report above.

Three methods were voted to be recommended to D-11 for advancement to standard: D 1053-58T, Method of Measuring Low-Temperature Stiffening of Rubber and Rubber-Like Materials by Means of a Torsional Wire Apparatus; D 1329-58T, Methods for Evaluating Low-Temperature Characteristics of Rubber and Rubber-Like Materials by a Temperature-Retraction Procedure (TR Test); and D 1349-58T, Recommended Practice for Standard Test Temperatures for Rubber and Rubber-Like Materials.

It was recommended, however, to retain D 736-54T, Test for Low-Temperature Brittleness of Rubber and Ruber-Like Materials, as tentative since it is an inaccurate method and is being replaced by D 746.

**Subcommittee 26 — Processability Tests. R. H. Taylor, Scott Testers,** chairman. Definite recommendations on shrinkage of both uncured and cured stocks will be made in June, 1960, according to the report of the task group.

J. F. Kerscher, Goodyear, reported that the task group on extrusion dies had information that ten companies had purchased the new, revised Garvey die, and that tests are under way to determine its suitability as an extrusion test die. The subcommittee agreed that this die should be referred to as the extrusion die no. 1 (Garvey type).

Several new testing machines and modifications of existing machines were discussed, but a survey of those present indicated that there were insufficient

such machines in use or not much data available from them as yet so that action by the subcommittee at this time is not indicated. The subcommittee will watch developments, however, and take action if experience warrants it.

**Subcommittee 27—Tests of Resilience. W. A. Frye, Inland Mfg. Division, General Motors Corp.,** chairman. Results of the questionnaire to determine the reproducibility of the Yerzley oscillograph indicated that no work on D 945-55, Test for Mechanical Properties of Elastomeric Vulcanizates under Compressive or Shear Strains by the Mechanical Oscillograph, is necessary at this time.

Another questionnaire on D 623-58, Test for Compression Fatigue of Vulcanized Rubber, revealed that the Goodrich flexometer has the widest use, but that stroke and local conditions varied considerably. The group felt, however, that no effort should be made to standardize nominal test conditions at this time.

Copies of a descriptive folder on the Wallace Sinusoidal Dynamic Strain Tester were shown by Testing Machines, Inc. It was reported that this machine was developed by A. R. Payne, Research Association of the British Rubber Manufacturers.

**Subcommittee 29—Compounding Ingredients. A. E. Juve, Goodrich,** chairman. The task group seeking to establish carbon black specifications reported that a proposed specification includes two properties taken from work of Committee D-24 plus values of stress-strain properties of a vulcanizate prepared in accordance with an interim method from D 1522-58T, Methods for Testing Carbon Blacks in Rubber. The subcommittee voted to recommend to D-11 that this interim method based on D 1522 be prepared as a replacement for D 1522 and be letter-balloted in D-11. The proposed specification with the values and limits suggested by the task group would also be letter-balloted in D-11 for adoption as a tentative specification.

The task group conducting aging tests on Industry Reference Black #1 reported that after 9 and 12 months' aging no measurable change in properties had been experienced. Checks will be continued at three-month intervals.

A task group will be appointed to study the problem of dispersion of pigments in rubber. This work will start with carbon black, but will include other pigments as well.

An announcement was made that the Bureau of Standards had available a reference lot of butyl rubber designated standard #388. It is available in 25-kilo packages at $45 each.

## Technical Committee A

The report of the activities of the SAE-ASTM Technical Committee on Automotive Rubber was submitted by H. Tangenberg, Goodrich, secretary.

The committee has letter-balloted and approved changes in specifications D 1055-58aT on latex foam, D 1056-58T on cellular rubber, D 1565-58T on vinyl foam, and D 735-58T on automotive elastomer compounds. The changes in D 735 involve the addition of low-temperature stiffness, reduction of compression set times to 22 hours, and the use of suffix numbers to replace the former subscript numbers.

Items published only by SAE include a new radial seal nomenclature, changes in the SAE Standard on V-belts and pulleys, and Recommended Practice on Automotive V-Belt Drives.

Work is nearly complete on an automotive air conditioning hose specification, modifications of ozone testing, a dipped goods and coating specification, and a specification on automotive seals.

The publicity chairman, J. M. Ball, Midwest Rubber Reclaiming Co., reported that the progress report type of publicity release of the past would no longer be issued, but that full paper treatment would be given any major completed program. This method has been used to date on the change from 70 to 22 hours for compression set test time in a paper by W. King, Acushnet Process Co., and on the new elastomer classification in the paper by Catton, Edwards, and Loring.

## ISO/TC 45 American Group

A report on the eighth meeting of Technical Committee 45 on Rubber of the International Organization for Standardization, which was held in New York, N. Y., October 1959, was made by Dr. Stiehler, leader of the American delegation. This meeting was attended by more than 70 delegates representing 10 countries.

A report of this ISO/TC 45 meeting was presented in RUBBER WORLD, January, 1960, pages 530-532. The following methods were approved for postal-ballot among the member countries: (1) density of latex; (2) volatile fatty acid number of latex; (3) nitrogen in latex; (4) coagulum in latex; (5) impact brittleness temperature; (6) resistance of vulcanized rubber to liquids; (7) adhesion of vulcanized rubber to metal (two procedures). In addition, approval was given for postal-ballot on standard atmospheres for conditioning and testing rubber and for amendments to the ISO/TC 45 recommendations on tensile and hardness testing (including a procedure for measuring the hardness of thin specimens).

The ISO/TC 45 Working Groups were reorganized and consolidated in the following 11 classifications: A. Chemical Tests; B. Latex Tests; C. Physical Tests on Unvulcanized Rubbers; D. Physical Tests on Vulcanized Rubbers; E. Viscoelastic Properties; F. Degradation; G. Electrical Tests and Ebonite; H. Flexible Cellular Materials; J. Classification of Vulcanized Rubbers; K. Products; L. Terms and Definitions.

The American delegation has been designated convenor (chairman) of Working Groups C and D. Germany and United States have been proposed to convene WG K on Products, but it was agreed to choose the convenor by postal-ballot.

Assignments were made to appropriate WG's on the preparation of specifications for both natural and synthetic rubbers and latices, foam rubber for hospital mattresses and transport seating, rubber hose, rubber rings for asbestos-cement pipe, rubber flooring, safety boots, ebonite, and anti-static rubber components for hospital use.

The American group for ISO/TC 45 has referred the matter of USA representation on the ISO/TC 45 Working Groups and the manner of voting on Draft ISO/TC 45 Recommendations to the advisory subcommittee of Committee D-11. The following representatives and alternates were recommended, subject to their acceptance by the advisory subcommittee.

| Working Group | Representative | Alternate |
|---|---|---|
| A | W. P. Tyler | I. D. Patterson |
| B | G. H. Barnes | L. A. Wohler |
| C | B. S. Garvey, Jr. | L. G. Mason |
| D | R. H. Taylor | L. V. Cooper |
| E | W. A. Frye | R. S. Havenhill |
| F | G. C. Maassen | H. Tangenberg |
| G | G. N. Vacca | W. J. Dermody |
| H | L. A. Wohler | G. H. Barnes |
| J | J. F. Kerscher | N. L. Catton |
| K | J. C. Montermoso | J. J. Allen |
| L | R. G. Seaman | S. Collier |

The advisory subcommittee proposed the following procedure for voting on Draft ISO/TC 45 Recommendations: The appropriate subcommittee chairman in Committee D-11 will review the Draft ISO/TC 45 Recommendation and compare it with existing ASTM standards. If there is substantial agreement between them, the American Group for ISO/TC 45 will recommend to the American Standards Association that the USA vote affirmatively, basing the vote on the previous vote in Committee D-11 for the ASTM standard. If there are substantial differences, the subcommittee chairman shall prepare a report summarizing the differences and including his recommendation for acceptance or rejection of the ISO/TC 45 version. This report and a letter-ballot on the Draft ISO/TC 45 recommendation shall be sent immediately to the members of Committee D-11. If there is no comparable ASTM standard, the entire Draft ISO/TC 45 Recommendation will be submitted for immediate letter-ballot in Committee D-11.

In view of the reorganization of the Working Groups in ISO/TC 45, it is planned to reconstitute the membership of the American group for this ISO Committee.

## Committee D-11 Assigns Three New SBR Numbers

Committee D-11 on Rubber and Rubber-Like Materials of the American Society for Testing Materials through Subcommittee 13 on Synthetic Elastomers of D-11 has assigned numbers to three new styrene-butadiene masterbatches, requested by Shell Chemical Co.

DESCRIPTION OF TYPES OF STYRENE-BUTADIENE (SBR) ELASTOMERS—ASSIGNMENT OF NEW CODE NUMBERS—ASTM D 1419-56T

| Number as assigned | 1606 | 1806 | 1807 |
|---|---|---|---|
| Date assigned | 1/19/60 | 1/19/60 | 1/19/60 |
| Requested by | Shell Chemical Co. | Shell Chemical Co. | Shell Chemical Co. |
| Distinctive feature | HAF black-process oil-masterbatch | FEF black-high oil-masterbatch | ISAF black-high oil-masterbatch |
| Close previous number, if any | 1804; OB-113-C | OB-106-X | OB-111-X |
| Type | 1600 | 1800 | 1800 |
| Nominal temp., °F. | 43 | 43 | 43 |
| Activator | FRA | FRA | FRA |
| Shortstop | ND | ND | ND |
| Antioxidant | ST | NST | ST |
| Catalyst | OHP | OHP | OHP |
| Emulsifier | RA | RA | RA |
| Nominal bound styrene, % | 23.5 | 23.5 | 23.5 |
| Conversion, % | 60 | 60 | 60 |
| Mooney viscosity, ML 1—4 (212° F.)—polymer | — | — | — |
| Compound | 56 | 50 | 68 |
| Coagulation | A | SA | SA |
| Carbon black type | HAF | FEF | ISAF |
| % | 32.1 | 30.4 | 35.3 |
| Finishing | normal | normal | normal |
| Oil type | HI-AR | NAPH | AR |
| Parts | 10 | 37.5 | 37.5 |

NOTE: Abbreviations and symbols are defined as follows:
FRA = free radical type, i.e., iron-pyrophosphate, peroxamine sulfoxylate.
ND = non-discoloring.
ST = staining.
NST = non-staining.
OHP = organic hydroperoxide.
RA = rosin acid.
SA = salt-acid.
FEF = fast extruding furnace black.
HAF = high abrasion furnace black.
ISAF = intermediate super abrasion black.
HI-AR = highly aromatic oil.
AR = aromatic oil.
NAPH = naphthenic oil.

## Tlargi Asks, "Make or Buy" Silicone Stocks?

Selection of the proper silicone starting material was the subject of the technical portion of the February meeting of The Los Angeles Rubber Group, Inc. The meeting was held in the Biltmore Hotel, Los Angeles, Calif., February 2, with 100 members and guests in attendance. W. J. Dugan, General Electric Co., Waterford, N. Y., discussed the selection of silicone gum, silicone compounds, or the new silicone reinforced gum, in his talk entitled, "Make or Buy?"

The introduction of these new reinforced silicone rubber gums was described as the first major change in product type since the introduction of silicone gums in 1951. This means that now three choices are available to the fabricator; use of purchased compounds, compounding from gum, or compounding from reinforced gum. Which of the three choices is best for a given fabricator depends on many factors relating to his business including: equipment available, diversity of his present product line, anticipated business growth, inventory requirements, and value added, as well as the prestige value of doing his own compounding.

Mr. Dugan discussed the advantages and disadvantages of each of the three possibilities. Compared to purchased compounds, the gums and the reinforced gums offer savings in material costs and simplified inventory control. They also give the ability to develop proprietary compounds enabling the fabricator to select the optimum product from the property and cost standpoint for every job. The reinforced gums offer additional benefits including mixing and processing time savings, better physical properties, and possible savings in equipment investment.

The speaker suggested that the small fabricator or one just getting into the silicone rubber fabrication should concentrate on the purchased gums as a general rule. The established silicone rubber fabricator should be directing his efforts toward the use of gums and only use purchased compounds to round out his product line.

### Dinner-Meeting

The Group also held the regular dinner-meeting, attended by 250 members and guests. Speaker after dinner was John Pettley. His talk was called "An Englishman at Large in America." Mr. Pettley is a noted British humorist and is the man who has proved that the English do have a sense of humor. A worldwide traveler with an impressive scholastic background, Pettley presented a hilarious and wholesome evening of fun and included a powerful message of goodwill along with his humor. He is at present on leave of absence from the Webb School of Claremont, Calif., in order to meet the demand for his lectures.

### Scholarship Fund

The Tlargi Memorial Scholarship Fund received two substantial gifts during December. The 1959 chairman of Tlargi, Charles Kuhn, Master Processing Co., presented a gift of $800 to the fund from his company which was made in lieu of Christmas gifts to customers.

The second gift was received from Lombard Smith, Lombard Smith Co., who made a grant of $5,000 in memory of his wife. These funds are to be made available for immediate use in undergraduate scholarships in Chemical Engineering. Two $750 scholarships, to be designated "Virginia Smith Memorial Scholarships," will be offered for the school year 1960-1961.

Students who will be full-time students in their junior or senior year in the Fall, 1960, semester and are interested in the rubber industry will be eligible for these scholarships. It is expected that recipients of these scholarships will take at least one of the credit courses in Rubber Technology offered by the School of Engineering. The scholarships will be made on the basis of merit, need, scholarship, and personal qualifications for a period of one year. It is expected, however, that a recipient in his junior year who maintains his record would receive first consideration the following year. Applicants should submit a résumé of pertinent information to the Head of the Department of Chemical Engineering, University of Southern California, Los Angeles 7, Calif., before the fifteenth of May.

### 1960 Officers

The meeting was conducted by the new slate of officers for 1960. B. R. Snyder, R. T. Vanderbilt Co., is the current chairman; W. M. Anderson, Gross Mfg. Co., associate chairman; C. M. Churchill, Naugatuck Chemical Division, United States Rubber Co., vice chairman J. L. Ryan, Shell Chemical Corp., secretary; and L. W. Chafee, Ohio Rubber Co., treasurer.

Directors for the year are C. H. Kuhn, Master Processing Corp.; A. J. Hawkins, Jr., E. I. du Pont de Nemours & Co., Inc.; A. P. Marone, Witco Chemical Co.; R. O. White, Caram Mfg. Co.; C. F. Ashcroft, Godfrey L. Cabot, Inc.; H. W. Sears, Stillman Rubber Co.; and R. L. Wells, Firestone Tire & Rubber Co.

## Ontario Group Reports

The January meeting of the Ontario Rubber Group was held at the Pickfair Restaurant, Mimico, Ont., Canada, January 19. The meeting was attended by more than 90 members and guests who enjoyed the cocktail hour, dinner, and talk.

### Processing Oil

The technical talk was given by Bill Oliver, Sun Oil Co., and was titled, "The Manufacture and Use of Petroleum Oil for Rubber Processing." He discussed in general terms the manufacture of rubber processing oils, the choice of crudes, and the steps taken to eliminate the variables as far as possible. The speaker also covered the physical and chemical properties of the three major classes of oils used in rubber processing. The effect of each class of compounding oil on the properties of vulcanizates of all the chief types of polymers in general industry use was described.

### Technology Course

The Ontario Group jointly with the Division of Rubber Chemistry of the Chemical Institute of Canada sponsored a rubber technology course on February 10 which was held at the Cloverleaf Hotel, Etobicoke, Ont. As reported at the January meeting above, this course departed from previous procedure in being held as an all-day single meeting rather than as a series of evening meetings. More than 130 men from the Toronto area attended the session, which consisted of seven lectures plus a noon luncheon. The lectures included: **"History,"** by Carl M. Croakman, Columbian Carbon Co., Canada, Ltd.; **"The Properties of Rubber,"** by Frank Capstick, Dunlop Canada, Ltd.; **"Rubbers,"** by W. J. Brown and E. E. Gale, Polymer Corp., Ltd., covering preparation, grades, and applications of natural and synthetic rubber; **"Compounding Ingredients,"** by D. G. Seymour, Cabot Carbon of Canada, Ltd.; **"Processing,"** Mr. Capstick; **"Products,"** R. A. Knowlton, B. F. Goodrich Canada, Ltd., covering tire construction; a second part of this lecture, on industrial products, was given by R. R. Tartaglia, Goodrich Canada; and **"Future of Rubber Industry,"** by A. Jaychuck, Goodyear Tire & Rubber Co. of Canada, Ltd.

## Thome Addresses WRG

Some 40 members of the Washington Rubber Group attended its February 18 meeting at the Army-Navy Club, Washington, D. C., to hear Ted L. Thome, technical proposal engineer, The General Tire & Rubber Co., speak on "Use of Rubber Grippers and Flatbags in Offshore Oil-Drilling Platforms."

Mr. Thome, following the luncheon and cocktail hour, showed a 35-minute film of the operation and construction of a "Texas Tower" offshore oil-drilling platform. An explanation was given of the use of pneumatic flatbags and grippers in raising structural components of platforms as high as 90 feet above the water. The film showed a hurricane blasting the tower after it had been constructed.

The next meeting of the Group, to be held March 16, will feature James Q. du Pont, great great grandson of the founder of the Du Pont company, talking on "Pattern for Success," attempting to show that there is no secret formula for success in business—large, medium, or small.

## CIC Rubber Division 1960 Meeting Program

The 1960 convention of the Division of Rubber Chemistry of the Chemical Institute of Canada will be held Friday, April 8, at the Walper House, Kitchener, Ont., Canada. Titles of the papers follow:

**"Advances in Silicone Rubber Polymers and Compounding,"** by C. W. Roush and A. M. Dunlop, Dow Corning Corp., Midland, Mich.

**"Determination of Physical Properties of a Five-Gram Sample of Rubber,"** by a speaker to be announced from Polymer Corp., Ltd., Sarnia, Ont.

**"Measurement of Dispersion of Carbon Black in Rubber,"** A. I. Medalia, Godfrey L. Cabot, Inc., Boston, Mass.

**"Improved Synthetic Rubbers for the Modern Tire,"** T. A. Riehl, Goodyear Tire & Rubber Co., Akron, O.

**"Polyurethane Elastomers, A Review,"** by M. Borr, Dominion Rubber Co., Ltd., Guelph, Ont.

**"Dynamic Mechanical Properties of Some New Polymers,"** A. D. Dingle, Dunlop Research Center, Toronto, Ont.

**"Elastomers,"** C. C. McCabe, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

**"Antiozonant Blends and Their Testing,"** J. Payne, Monsanto Chemicals, Ltd., London, England.

## NCRG Hears Food Law

The Northern California Rubber Group held meetings in January and February. Both gatherings took place in the Elk's Club, Berkeley, Calif. The January 14 meeting featured a talk by Inspector Logan L. Page, Oakland Police Department, and consisted of descriptions and advice on how to avoid being taken by "Bunco" artists.

The February 11 meeting had, as after-dinner speaker, McKay McKinnon, Jr., San Francisco District Director of The Food & Drug Administration, who spoke on the "Views of the Food and Drug Administration." His talk was on the Food Additives Amendment which becomes fully effective March 6, 1960. The new law defines "food additive" as "any substance . . . the use of which results in its becoming a component or otherwise affecting the characteristics of any food (including any substance for use in packaging, manufacturing, producing, packing, processing, preparing, treating, transporting, or holding food)."

Mr. McKinnon stated that many misconceptions and misapprehensions concerning the amendment have come to light. He distributed a tentative outline of information useful in determining the status under the amendment of materials contacting food. The outline represented a minimum of data essential for determining possible migration to food. The speaker stressed that the FDA could only give an opinion on the use of a material after it had been furnished with information as to how much, if any, of the material migrates to what specified food.

He closed his talk with the assurance that the FDA would do all it can to help bring about orderly and effective general compliance with this most recent addition to the Food, Drug and Cosmetic Act.

[Further information on current status of rubber industry meetings with FDA officials and clarifying steps to be taken will be found in the Washington Report of this issue—EDITOR.]

## RCSAA Meetings

The Rubber Chemical Salesmen's Association of Akron (Ohio) met at noon, February 26, at the University of Akron, Akron, O. The program was conducted by Gilbert Gingold, Sid Richardson Carbon Co., who showed the Dartnell Corp. film, "Developing Your Sales Personality."

W. M. Rich, of Henry J. Clayman & Associates, spoke at the January 29 meeting of the Association. His subject was "The Human Aspects of Advertising."

Also, the following new officers took their posts at this meeting: John Shrontz, Harwick Standard Chemical Co., president; Warwick McCutcheon, J. M. Huber Corp., vice president; Laurence Pieroth, Naugatuck Chemical Division, United States Rubber Co., secretary; and William Bowers, Midwest Rubber Reclaiming Co., treasurer.

At a board of trustees meeting earlier in January, Dewey Butt, Standard Oil Co., resigned as newly elected vice

president, because of relocation. Mr. McCutcheon was appointed to fill the unexpired term. The following committee chairmen were also appointed: program, Mr. Gingold; social, M. E. Noah, C. P. Hall Co.; and publicity, Ernest Puskas, Thiokol Chemical Corp.

All meetings of the Association are held at the University of Akron. Future meetings are planned for March 25, April 29, May 27, September 30, October 28, and November 25.

## CALENDAR of COMING EVENTS

March 21-23
American Physical Society. Detroit, Mich.

March 22-24
Division of High-Polymer Physics, APS. Detroit, Mich.

March 24
Southern Ohio Rubber Group. Gibbons Hotel, Dayton, O.

March 25
New York Rubber Group. Henry Hudson Hotel, New York, N. Y.
Rubber Chemical Salesmen's Association of Akron. University Club of Akron, Akron, O.

April 5
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.

April 5-14
American Chemical Society, Cleveland, O.

April 7
Rhode Island Rubber Club. Pawtucket Country Club, Pawtucket, R. I.

April 8
Rubber Division, CIC. Annual Meeting. Walper House, Kitchener, Ont., Canada.
Akron Rubber Group. Sheraton Hotel, Akron, O.

April 14
Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.
Northern California Rubber Group.

April 20
Quebec Rubber & Plastics Group and Montreal Section CIC. Joint Meeting on "Industrial Development." Queens Hotel, Montreal, P.Q., Canada.

April 22
Detroit Rubber & Plastics Group, Inc. Detroit Leland Hotel, Detroit, Mich.
Chicago Rubber Group. Furniture Club, Chicago, Ill.

April 29
Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.
Rubber Chemical Salesmen's Association of Akron. University Club of Akron, Akron, O.

May 3-6 *(Note corrected dates)*
Division of Rubber Chemistry, ACS. Statler Hotel, Buffalo, N. Y.

May 20
Connecticut Rubber Group.

May 23-26
Design Engineering Show. Coliseum, New York, N. Y.

May 27
Rubber Chemical Salesmen's Association of Akron. University Club of Akron, Akron, O.

June 3
Quebec Rubber & Plastics Group. Golf Tournament. St. Hyacinthe, P.Q., Canada.

June 4
Southern Ohio Rubber Group. Inland Activities Center, Dayton, O.

June 9
New York Rubber Group. Outing. Doerr's Grove, Millburn, N. J.
Rhode Island Rubber Club. Outing. Pawtucket Country Club, Pawtucket, R. I.

June 10-11
Southern Rubber Group. Birmingham, Ala.

June 17
Akron Rubber Group. Outing. Firestone Country Club.
Boston Rubber Group. Outing. Andover Country Club, Andover, Mass.

June 24
Detroit Rubber & Plastics Group, Inc. Outing. Western Country Club.

June 26-July 1
American Society for Testing Materials. Annual Meeting and Subcommittee Meetings. Atlantic City, N. J.

August 2
New York Rubber Group. Golf Tourney. Forsgate Country Club, Jamesburg, N. J.

August 19
Philadelphia Rubber Group. Annual Outing. Manufacturer's Country Club, Oreland, Pa.

September 6-16
Production Engineering Show. Navy Pier, Chicago, Ill.

September 8-9
Chemical Institute of Canada and National Research Council. Tenth Canadian High Polymer Forum. Alpine Inn, Ste. Marguerite, P.Q., Canada.

September 9
Connecticut Rubber Group.

September 10
Northern California Rubber Group. Outing.

September 11-16
American Chemical Society. New York, N. Y.

September 13-16
Division of Rubber Chemistry, ACS. Hotel Commodore, New York.

September 29
Southern Ohio Rubber Group. Engineers Club, Dayton, O.

September 30
Rubber Chemical Salesmen's Association of Akron. University Club of Akron, Akron, O.

October 4
The Los Angeles Rubber Group, Inc.

October 7
The Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.
Detroit Rubber & Plastics Group, Inc. Detroit Leland Hotel, Detroit, Mich.

October 7-8
Southern Rubber Group. New Orleans, La.

October 9-11
Rubber & Plastics Division and Erie Section, American Society of Mechanical Engineers. National Conference of Rubber and Plastics Engineers. Hotel Lawrence, Erie, Pa.

October 13
Northern California Rubber Group. Past Presidents' Night.

October 14
Boston Rubber Group. Hotel Somerset, Boston, Mass.

October 17-21
National Safety Council. Forty-Eighth Annual National Safety Congress. Chicago, Ill.

October 21
New York Rubber Group. Henry Hudson Hotel, New York, N. Y.

# WASHINGTON REPORT

By JOHN F. KING

## FDA Food Additives Law Reviewed Again by RMA

As mentioned last month, the United States Food & Drug Administration advised The Rubber Manufacturers Association, Inc., on January 26 that it would grant no industry-wide extensions under the Food Additives Amendment of 1958, beyond the present deadline of March 6, 1960. The FDA added that it would consider petitions from individual manufacturers on a product-by-product basis, but set the deadline for filing such petitions at February 1, 1960.

### RMA-FDA February 17 Meeting

The special RMA committee investigating the specific impact of the 1958 amendment on thousands of rubber products used by the food industry met with the FDA and its Food and Pharmacology departments on February 17. The history of the rubber goods manufacturing industry with special reference to products designed for use by the food industry was reviewed, and it was pointed out that these products were designed for long life and not to be a source of food additives. It was explained further that about 5,000 such products were made from 50,000 to 60,000 different rubber compounds, and that checking each one of these products represented a very difficult assignment since the burden of proof is on the rubber product manufacturer. The FDA can prohibit the use of rubber products by the food industry if there are substances in these products that would extract or migrate out of the product and become a harmful additive of the food with which they come in contact.

The FDA will not grant approval of any rubber product, but only provides an advisory opinion, except for products for which sanctions had been granted prior to the September, 1958, amendment. In this connection, the *Federal Register* for February 2, 1960, page 866, listed materials used in the manufacture of food packaging materials for which such prior sanctions had been granted. These materials included certain antioxidants, plasticizers, release agents, driers and drying oils (as components of finished resins).

In reviewing requests for advisory opinions, the FDA stated that it will not reveal the rubber compounds involved, but it will reveal the procedures and methods of test used by the rubber products manufacturer in requesting opinions of the FDA. The B. F. Goodrich Co. recently sought such opinions from the FDA, and these were said to be favorable in connection with a series of conveyor belts, brewery hose, and milking inflations. Goodrich stated that it established a special chemical laboratory about a year ago to undertake a food additive evaluation program for its products used by the food industry. Scientists and technicians, set up as a separate group within the company's existing department of industrial hygiene and toxicology, have conducted thousands of tests to determine the proper materials to use in manufacturing products used in connection with food. It is the test methods such as those used by Goodrich that the FDA apparently is willing to reveal to other rubber products manufacturers.

The RMA has established a five-man technical subcommittee to work with the FDA's Department of Pharmacology to develop a series of extraction tests for rubber products used in the food industry, following its February 17 meeting with FDA. The development of these methods of test should be of real benefit in clarifying the future situation with the 1958 amendment.

### Further Clarification

Meanwhile, rubber products manufacturers may on their own responsibility continue to market products to the food industry, depending on their interpretation of that part of the law which states, "the term food additive means any substance, the intended use of which results or may reasonably be expected to result directly or indirectly in its becoming a component or otherwise affecting the characteristics of any food." If the manufacturer has satisfied himself that his product may *not* reasonably be expected to result directly or indirectly in its becoming a component, etc. . . . he may assume the responsibility for marketing his product without securing an opinion from the FDA. It is felt that this approach may enable manufacturers to eliminate 80% of their products from consideration as possible sources of food additives.

As a result of the February 17 meeting between the RMA special committee and the FDA, a statement of the position of the FDA on many points of interpretation of the 1958 amendment was prepared and was released March 8 by Edward Welch, secretary of the RMA committee. Details available next month. ED.

## Rubber-Coated Navy Missile Creates Department Controversy

The Navy's family squabble over "Project Wagmight"—an inflatable, neoprene-coated nylon-fabric missile for delivery of atomic weapons—broke out into the open briefly in mid-February, but was quickly hushed up and is now a family secret again.

The House Space Committee held a half-day public hearing February 9 on the disputed rubber missile after Chairman Overton Brooks (Dem., La.) became interested in the project as a cheap, highly mobile weapon system that could be put to either tactical or strategic use.

The architect of the Wagmight Project, Capt. Cooper Bright, USN, had argued for construction of at least one of the missiles and, failing that, for a feasibility study of their construction and use later. His superior, Vice Admiral John T. Hayward, Deputy Chief of Naval Operations for Development, was, however, of a different view. He told the Committee that if it wanted to spend additional monies on Navy

weapon systems, then fine, but he would spend it elsewhere for more practical and urgently needed programs.

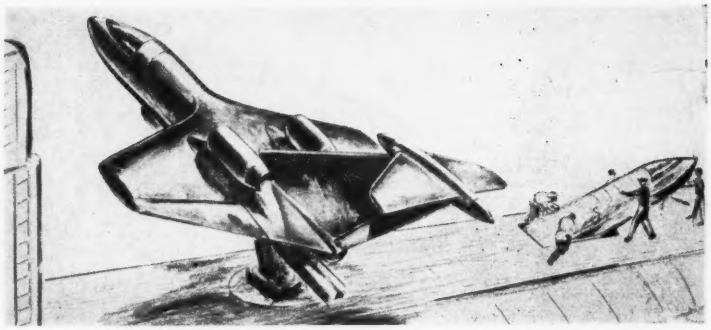
The Committee thereupon went into executive session to quiz the disputants behind closed doors. It is rumored that Captain Bright stuck to his guns that the project is feasible and needed, despite the heavier artillery from Admiral Hayward. It is also rumored that under committee questioning, the Admiral conceded that the fabric would be useful for a number of purposes, including Wagmight, even though he had raised technical criticism against both Wagmight and the usefulness of the neoprene fabric in open session. It finally is rumored that the Admiral at the windup of the secret session agreed to consider spending Navy research and development funds on a contracted study of the feasibility of Project Wagmight plus the usability of the neoprene fabric in other programs.

So the program and the related controversy over it presumably continue within the Navy Department. It is understood, however, that the Defense Department's Branch of Defense Research & Engineering, under Dr. Herbert F. York, is taking a look at the Wagmight project with an eye to its feasibility. Defense Secretary Thomas S. Gates, Jr., told the House Appropriations Committee in January that DOD had studied Wagmight, but indicated it was shunted aside as being not practical.

Captain Bright conceived Project Wagmight about two years ago after Goodyear Aircraft Corp. developed the neoprene-nylon fabric which Goodyear has since incorporated in the much publicized "Inflatoplane." Although Bright's study was Navy-initiated and operated under official auspices, the Captain did call on Goodyear for two company engineer-specialists in the fabric and stress fields. The Navy then shelved the study about a year ago. The story of the rubber missile got into print last December and has received some publicity since then. The Navy officially has had little to say about it until the Brooks Committee got into the act.

As Bright designed it, Wagmight could operate as either weapon-carrying missile or aircraft, drone or decoy, performing low-altitude, long-range missions at about 450 miles per hour. It would be 39 feet long with a wing span of 20 feet, powered by twin jet engines mounted on the upper side of the wing. With a catapult or rocket-assist launcher, a surface ship or submarine, or even large army trucks, could fire it. Its chief attraction is its reportedly versatile packaging capability—it could be carried about in a cylindrical container 50 inches in diameter and 23 feet long—and its ability to be assembled and fired in 30-60 minutes.

Finally, Bright's study indicates that production could begin within 12 months by virtue of the fact that the inexpensive weapon would be equipped with "off-the-shelf" powerplants and guidance. Such prompt delivery of such a weapon into U. S. missile arsenals, moreover, might help close the celebrated "missile gap" beginning next year when the Soviet Union achieves a numerical advantage in long-range missiles.



Artist's conception of Wagmight missile being launched from a submarine

## Bill to Repeal Bike Tire Tax

The Senate Finance Committee has approved the first tax-cutting bill of this session of Congress to pass the House, which must originate revenue measures. The House bill, sponsored by Rep. Eugene J. Keogh (Dem., N. Y.), would repeal the manufacturers' excise tax on tires and tubes supplied with new American-manufactured bicycles. Senate action was expected early in March.

Despite opposition during floor debate that the tax repeal would not benefit consumers, the House passed the measure February 2 after its sponsor appealed for correction of a "glaring discrimination" imposed by the tax code on bicycle manufacturers. The American producer, Keogh said, pays his rubber supplier the tax of 5¢ per pound on tire purchases and 9¢ for each pound of tubes; while the importer of bicycles is exempt from the excise. Keogh emphasized that his bill would not repeal the tax on replacement tires and tubes, but only on equipment sold with a new bicycle. He estimated the tax-saving would knock about 25¢ off the cost of producing an American bicycle, adding that this is important to U. S. manufacturers because it amounts to about one-third of their per unit profit.

Rep. John W. Byrnes (Rep., Wis.), pointed out the Treasury was against the bill on grounds it would cost $500,000 annually in federal revenues.

"Instead of reducing our revenues by $500,000 per year by passing this bill we should be increasing our revenues by imposing the tax on tires imported on foreign-produced bicycles and other imported vehicles," he said.

Rep. Charles Vanik (Dem., Ohio) drew a laugh from the House when he rose in opposition to the measure with:

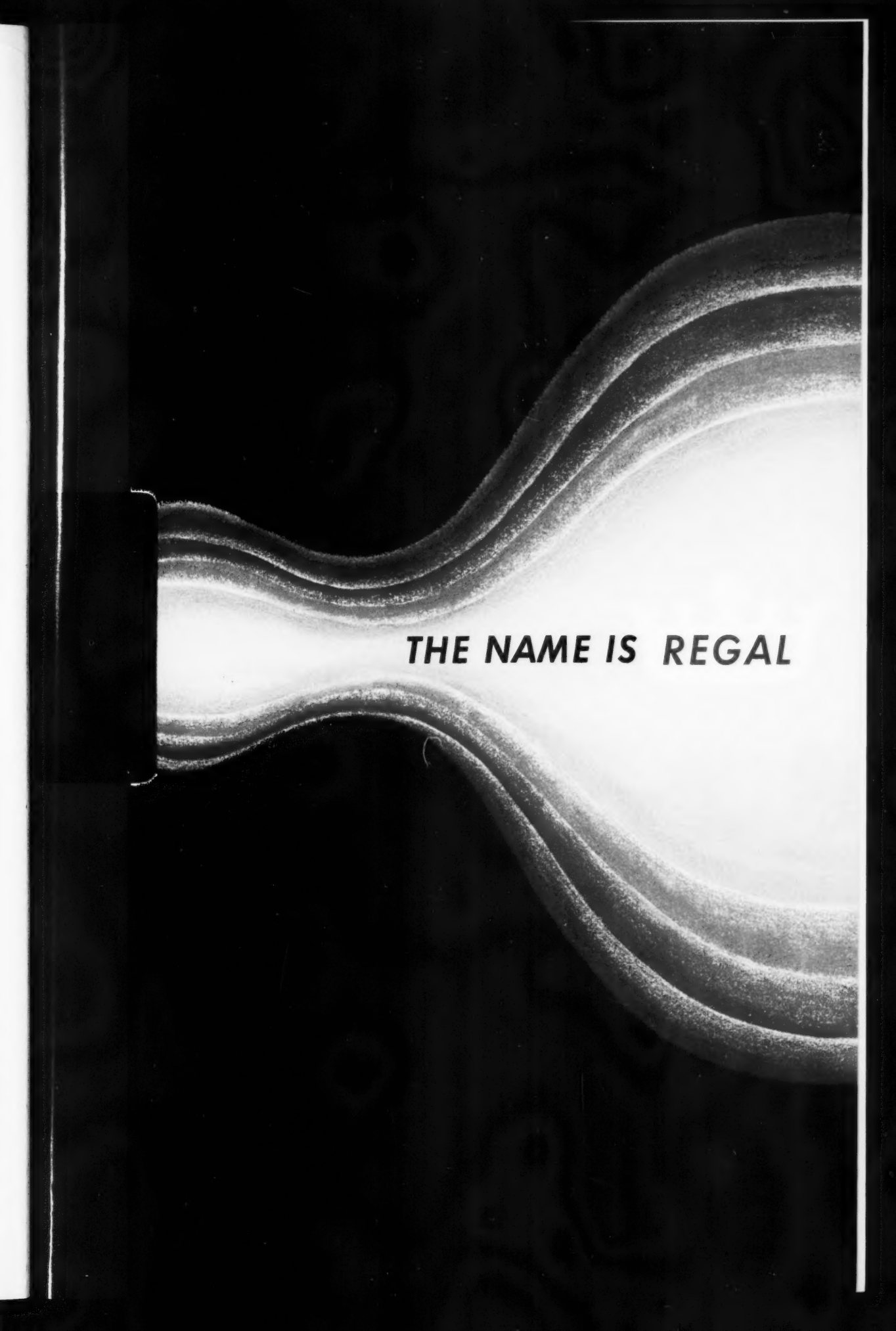
"The proponents of this legislation argue for the help it will provide for the American domestic bicycle producing industry. What parts of a so-called American bicycle are made here? The average so-called American bicycle has chain drives which are made in Japan, the brake housings in West Germany, the shift mechanism either in England or Switzerland, the spokes in Sweden or Belgium, while many tires are made in Holland. There are grave doubts that the 'Made in America' decals which are used on the bicycle are made here."

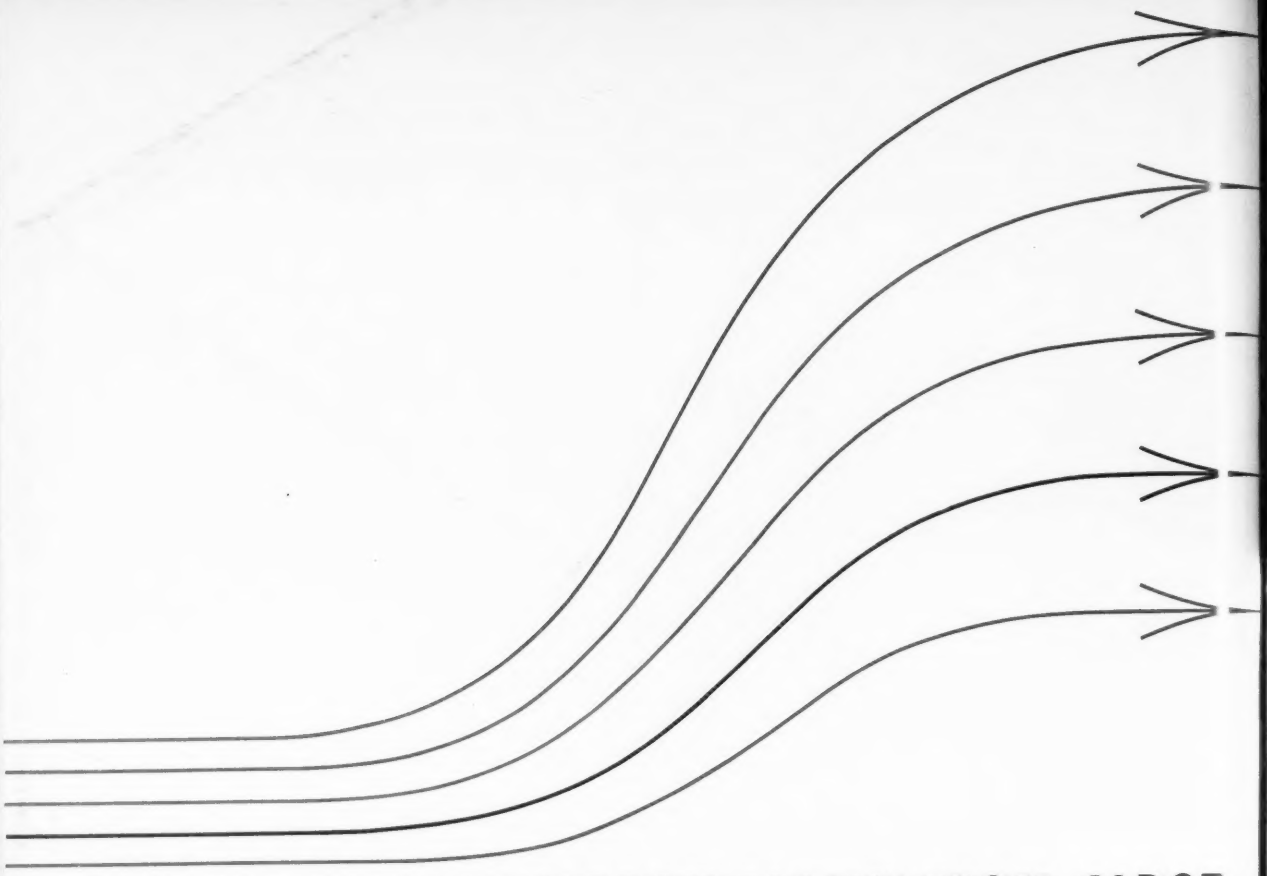
## Anti-Trust Bill Seeks To Punish Individual

Legislation to crack down on management officials caught violating anti-trust laws has been introduced by Rep. Frank Thompson (Dem., N. J.) as a result of a New York Federal Court case last November involving The Rubber Manufacturers Association, Inc., and 10 member companies.

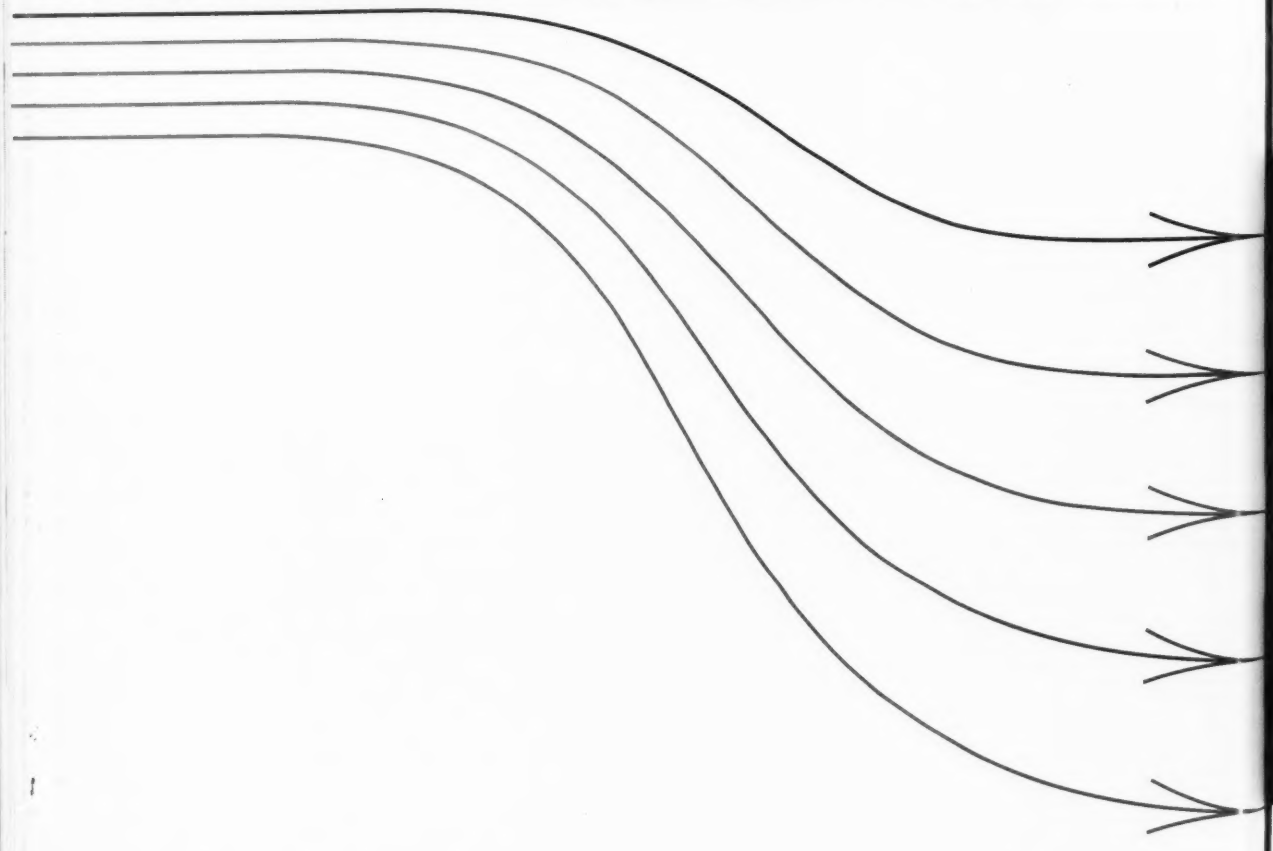
The case, in which RMA and the other defendants entered a plea agreeing to the criminal violation judgment without admitting guilt of violating the Sherman Anti-Trust Act, was featured by the comment of trial Judge Gregory F. Noonan that the Justice Department should seek to indict individual violators, not corporate beings. In rejecting the Department's argument for a stiffer penalty than the $177,500 total fines he imposed, the Judge said that "I have a deep-rooted feeling that perhaps the best way to enforce the laws against chronic violators is to put in jail some of the individuals (named in the indictment). You can't send a corporation to jail."

The new Thompson Anti-Trust Bill, now pending in the House Judiciary Committee, provides that whoever is convicted of any violation of the Anti-Trust laws may, in the discretion of the court, in addition to any other punishment provided by law, "be barred for not more than one year from serving, directly or indirectly, in the capacity


THE NAME IS REGAL



**...A NEW FAMILY OF CARBON BLACKS FROM CABOT**



# RE

**Regal** is the name of a brand-new family of carbon blacks, developed by the Cabot Research & Development Department and produced world-wide by a new, exclusive manufacturing process from oil. Now commercially available for the first time are blacks which duplicate, and in some cases excel, the performance characteristics of gas-SRF and premium-priced channel blacks . . . blacks which offer properties never before available in oil furnace grades. (Unlike HAF, ISAF and SAF types of oil furnace black, Regal blacks are lower in structure, exhibit lower
and higher elongation.)

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expensive channel black

**NEW REGAL 300** is an excellent channel replacement oil black, combining virtually identical channel black properties with the faster curing rate of HAF types.

**NEW REGAL 600** provides a striking combination of low hardness/high tread wear resistance properties never before provided by a carbon black, offering interesting product improvement possibilities, not available from either gas-produced or other type oil furnace blacks.

**NEW REGAL SRF**, the industry's first oil furnace SRF black, matches, and in some cases excels, the performance characteristics of gas-produced semi-reinforcing furnace carbon blacks.

They are now in commercial production and available world-wide — another step in Cabot's long-range program to meet threatened gas shortages and rising natural gas prices.

# GAL®

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lack pigments.

## Good News – Here and Abroad

This is obviously good news – economically – for the rubber industry both in the United States and abroad. Since Cabot Regal blacks are available from overseas Cabot plants in local currencies, gas-SRF and channel blacks need no longer be imported from the U. S. in exchange for American dollars. The ready availability of Regal blacks world-wide makes possible greater overseas customer convenience in ordering, assuring more rapid and efficient deliveries than are possible with importation of U. S. gas-produced blacks. Nor will Regal black prices be affected by the increasingly prohibitive cost of natural gas, for the entire family is produced by a new method of manufacture from oil.

## PERFORMANCE CHARACTERISTICS OF 3 NEW REGAL BLACKS

### REGAL 300

a channel replacement oil black, combining virtually identical channel black properties with the faster curing rate of HAF types. Comparable with EPC black in modulus, elongation and tensile strength. Regal 300 has actually outperformed channel blacks in wear and tear resistance, cracking and chipping, in passenger car tire and truck tire road tests. Recommended for highway, off-the-road truck and passenger car tire treads, and tread rubber, where service requires typical channel black resistance to tearing, cutting and chipping.

### REGAL 600

a brand-new type oil furnace black, giving low hardness and low modulus in passenger car tire treads and tread rubber for quieter ride and better traction properties, combined with the excellent tread wear resistance of an ISAF black. Has outperformed ISAF black in cold SBR, oil-extended SBR, and natural rubber, by giving higher tensile strength and elongation, lower modulus and hardness, lower heat generation, higher electrical conductivity and superior cut growth resistance.

### REGAL SRF

a semi-reinforcing furnace black made from oil, is interchangeable with gas-SRF, giving physical properties and processing characteristics equal to gas-produced SRF blacks. Priced the same as gas-SRF. Equivalent modulus, hardness, tensile strength, elongation, tear resistance, resilience and compression set in natural rubber, SBR, butyl, neoprene and nitrile rubber.

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# Technology scores a breakthrough — as a carbon black producer makes oil furnace carbon blacks with properties never before available

# REGAL

Cabot introduces these three Regal blacks ...Regal 300...Regal 600...Regal SRF... as the first of a whole family of new type oil furnace blacks. Through this revolutionary new process, the Cabot variety of oil furnace blacks will continue to be extended to include quality grades never before made available. Thus, by adding new blacks to the group being manufactured from oil, Cabot continues to assure an uninterrupted supply of carbon blacks for all purposes, worldwide, from raw materials not subject to the economic pressures affecting natural gas, and at locations where there is no natural gas. Regal is another notable first for Cabot, world's largest producer and seller of carbon black, industry leader for 78 years.

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of officer, director, executive, legal counsel, or in any similar capacity with any corporation or corporations convicted in the same proceeding."

In addition, the measure would bar any corporation official from receiving any compensation, remuneration, or other consideration, directly or indirectly, "by way of indemnification for being so barred."

Thompson, a key figure in the recently formed and potentially powerful Democratic Study Group, which is bent on more "liberal" legislation of all sorts, said he introduced the measure, HR 9839, at the request of George J. Burger, vice president of the National Federation of Independent Business. In explaining the measure, Thompson said that "Doctors and lawyers can be, and are, barred from practicing their profession because of illegal practices. My new bill has a similar intent where corporation officials are concerned."

## Stockpile Liquidation

The Administration's plan to liquidate one-third of the estimated 1.2 million long-ton natural rubber stockpile over the next eight years passed its first test and appeared to be headed for smooth sailing through Congress this year.

The House Armed Services Committee early in February put its stamp of approval on the rubber disposal plan after only a brief explanation of what the legislation implies from the Office of Civil & Defense Mobilization. OCDM Deputy Director J. Roy Price said the Executive Branch wants to sell off 470,000 tons of stocked rubber by the end of fiscal 1968. This disposal program includes the 40,000-50,000 tons that will be sold by the end of this fiscal year on June 30. The idea of the stretched-out sales schedule, which he said envisages liquidation of about 50,000 tons annually, is to avoid disrupting foreign and domestic rubber markets.

In his presentation Price said the percentage of natural rubber used in United States manufacturing has declined to less than one-third of total rubber consumption. He added that "continued research promises the development of new synthetics with physical properties superior to those of natural." Moreover, he added, the sell-off would be in line with the revised estimate of national mobilization need of rubber in an emergency, which in 1958 was reduced from five to three years.

Senate Armed Service Committee sources indicated there was little likelihood of controversy stalling the measure before this year's expected early adjournment of Congress. The stockpile may not be touched without specific approval of the Legislative Branch.

## Firestone Synthetic Rubber for India

India will get another rubber facility, according to an announcement by the Firestone Tire & Rubber Co. Firestone, in partnership with local private interests in India, plans to build a $30-million synthetic rubber producing plant near Bareilly. This announcement follows by less than a month the plans revealed by the Goodyear Tire & Rubber Co. that an affiliate, Goodyear Tire & Rubber Co. of India, Ltd., would build a $12-million tire and tube plant near New Delhi.[1]

An interesting feature of both plans is the use of the Export-Import Bank for loans in rupees for the consummation of the respective contracts. The Firestone loan will be the largest foreign-currency loan ever extended by Eximbank, a total of 27.1 million rupees, or the equivalent of $5.7 million. The loan for the Goodyear project will amount to 22.5 million rupees, or $4.7 million.

Funds used by the Eximbank for these loans are taken from foreign-currency accounts owned by the Federal Government. These accounts are built up from sales of government surplus farm products to friendly nations made in local currency. The total amount of these funds now aggregates more than $1 billion.

The Eximbank loans are made to both United States and foreign businesses requiring local currencies to encourage the use of private enterprise in these friendly nations.

The Firestone loan, to be repaid in nine years, was actually made to India Synthetics, Ltd., a joint company formed by Firestone and Kilachand, Devchand & Co., Private Ltd., Bombay.

[1] RUBBER WORLD, Feb., 1960, p. 723.

## Guayule Seed Sale

The wartime emphasis on an emergency supply of guayule seed for possible use in building supplies of rubber will finally reach the end of its usefulness when the General Services Administration sells off its 17,462 pounds now on hand. Bids will be evaluated on a competitive basis for the sale, which will take place in August.

The seed inventory was built up during the Korean War and is now being sold because it "cannot be counted on as an emergency supply of natural rubber," according to GSA. Under the 1946 stockpile act, GSA may not offer to sell obsolete strategic goods from the mobilization inventories until a six-month waiting period expires.

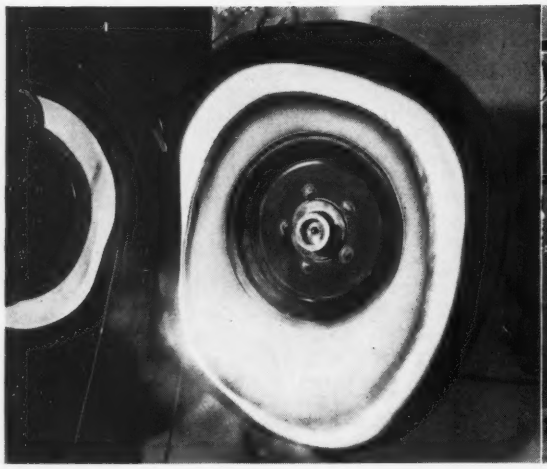
Guayule is a source of low-grade natural rubber which can be cultivated in the warmer, dryer areas of the North American Continent. GSA bought the seed at a time when access to natural rubber producing areas of southeast Asia was threatened in 1950-1953. Since mobilization now is predicated on a three-year emergency period instead of the five-year base used until 1958, GSA figures the length of time required to permit the seed to grow to producing plants would mean that guayule would not provide a "timely" substitute for natural rubber should supplies be shut off.

While there is no great production of guayule, currently a small quantity is produced in southern California.

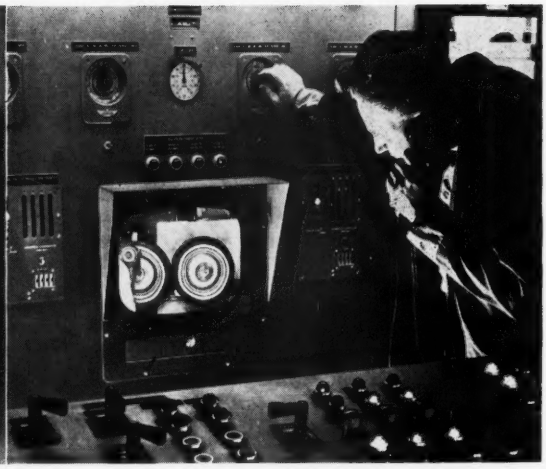
# INDUSTRY NEWS

## Goodyear Shows High-Speed Air And Race Tire Testing System

The Goodyear Tire & Rubber Co., Akron, O., recently unveiled a multi-stage dynamometer tire testing system, valued at $2 million. The test equipment, built by Adamson-United Co., Akron, enables Goodyear technicians to develop, test, and qualify tires for the highest-performance jet aircraft and the fastest racing cars. To the designers of aircraft tires, the system provides the means to duplicate exactly all of the operational conditions of taxiing, take-off, and landing—including the tremendous impact and the yawing and



Conventional passenger-car tire *(right)* fails at about 300 mph. in "tire-on-tire" test on one unit of the new Goodyear dynamometer



A high-speed tire-test is monitored by a Goodyear technician on a closed-circuit TV in a control room adjacent to the test room

the twisting of tires as a plane touches down on a runway.

Acceleration and deceleration capabilities of the 8,600-horsepower machine exceed any present or anticipated future aircraft requirements, Goodyear engineers reported.

The machine has two separate units and is capable of testing either airplane or automobile tires. One side of the machine features a unique "tire-on-tire" test facility, said to be the only one of its kind in the country. On this unit two tires are pressed together, tread to tread, to duplicate actual load conditions, and then driven at surface speeds that can be boosted to more than 500 miles per hour.

The second unit features a huge flywheel, 10 feet in diameter, with a tire carriage on each side. Used primarily for testing aircraft tires, it is capable of surface speeds of 320 miles per hour. The unit is said to be the first in the tire industry which is capable of accelerating a tire from 0 to 320 mph. in less than 20 seconds under a 30,000-pound load condition. Loads of better than 80,000 pounds and tire sizes from 16 inches to more than six feet in diameter can be accommodated.

Because of the physical dangers involved in running tires at such speeds, the actual testing is viewed on closed circuit television. TV screens, linked to cameras focused on all four of the four test carriages, are mounted on each of the two elaborate control panels in a room adjacent to the testing room.

The dynamometer system is powered by two electric motors and is designed so that both ends of the motor shaft can be utilized as drivers. One side drives the flywheel, with a test carriage on each side. The opposite end of the shaft actuates a gear which, in turn, drives two pinions on which tires are mounted.

Floor space for the entire operating of the testing facility is 9,375 square feet, including controls, power equipment, wheel and components, and storage area.

## Naugatuck Chemical Plans Technical Center

Naugatuck Chemical Division, United States Rubber Co., plans to construct a new technical center near its main plant in Naugatuck, Conn., to broaden research for new products and speed technical service for customers of the Division's expanding line of chemicals, rubbers, and plastics.

Engineering for the new structure is under way. Construction will begin in mid-1960, and completion is scheduled for 1961.

The new center will expand the Division's facilities for the development of new products and will expand and improve its technical service to customers by broadening its facilities for physical testing, compounding, and other forms of product evaluation, according to Wesley S. Coe, director of research and development, who will be responsible for the new facility.

The center will have approximately 37,500 square feet of floor space and will be equipped with the most modern machines available for testing rubbers, chemicals, and plastics. The center will also house equipment on which new products can be produced and tested under operating conditions which simulate actual production-line techniques. It will be staffed with about 100 scientists and technicians from the Division's research and development department.

The new center will incorporate in both a functional and decorative way many end-products which contain the chemical products manufactured by the Division.

## Will Fabricate Fluorocarbon Products

Plastic & Rubber Products Co. has formed a new fluorocarbon division, at 1642 W. 135th St., Gardena, Calif., to fabricate standard O-rings, V-ring packings, Teflon scrapper rings, grommets, and static face seals as well as back up and spiral back up rings. The division will be processing Teflon sheet, rod, tube, and tape. Materials to be processed include—in addition to Teflon — Kel-F, nylon, and polyethylene.

The new plant is said to be the first of its kind in the West to incorporate complete temperature and dust control measures. The temperature in all areas, including fabrication, burring, loading, shipping, and inspection, will remain a constant 72° F. with a 50% humidity factor. Dust control will be accomplished in the processing and molding areas through pressurization. The pressure inside will be a constant two pounds greater than outside. The cooler, pump, thermostat, and filtering system will remove all dirt and dust particles above two microns. Temperature control is a vital element in fabricating Teflon since the material size increases and decreases in direct proportion to temperature variance. Pressurization resulting in dust control will insure end-product cleanliness and greatly enhance product reliability.

The new division will be staffed with an engineering department to handle special engineering problems including design, prototype development, and special part fabrication.

## Ameripol SN and CB To Go On-Stream in 1961

Goodrich-Gulf Chemicals, Inc., Cleveland, O., recently announced that advanced engineering work is underway toward the commercial production of Ameripol SN rubber (polyisoprene) discovered by G-G in 1954, and Ameripol CB (*cis*-polybutadiene) rubber, a more recent development. It is anticipated that both of these rubbers would be produced interchangeably in the same commercial plant facility.

Lucien O. Crockett, G-G president, reported that the company anticipates an initial commercial plant with an annual capacity of about 25,000 tons, slated to go in operation by late 1961. Plant sites now under consideration include two presently owned locations in Orange County, Tex., and Institute, W. Va.

Ameripol SN, one of the first synthetic rubbers with the same molecular structure as natural tree rubber, was first announced by Goodrich-Gulf in 1954. Since the discovery of Ameripol SN, the firm's pilot-plant operation at Avon Lake, O., has produced five distinct types in tonnage quantities for large-scale testing. Their testing program has demonstrated that Ameripol SN can be substituted for natural rubber which is presently required in the manufacture of truck, bus, airplane, military, and off-the-road tires.

Ameripol CB, which will be produced interchangeably with Ameripol SN, has excellent characteristics for resisting heat, which is a prime cause of the deterioration of truck tires and other rubber products. Road tests of tires containing from 25 to 90% Ameripol CB indicate both improved tread wear and superior riding characteristics.

Primary initial use of both new rubbers, predicts J. W. Keener, president of The B. F. Goodrich Co., will be to build natural rubber properties into tires for trucks, heavy construction equipment and aircraft, while reducing their now substantial tree rubber content.

It is expected that Ameripol SN and CB will be competitive in price not only with announced prices of other synthetics of these types, but also with natural rubber, which reached a per-pound price peak of 48¢ in 1959 and currently is selling at 40-42¢.

The principal ingredient of Ameripol CB is butadiene, which is also the main component of SBR general-purpose synthetic rubber. Goodrich-Gulf has an annual butadiene production capacity of 150,000 tons, thus insuring adequate raw material supplies for this new rubber.

The development of processes for producing isoprene, the principal raw material for Ameripol SN, has kept pace with other industry developments, and it is expected that isoprene will soon be available in adequate supply from domestic sources.

## Allied to Triple Nylon-6 Output

Plans to triple Allied Chemical Corp.'s annual production of Golden Caprolan nylon-6 tire yarn were recently announced by Kerby H. Fisk, chairman of the board and chief executive officer. Allied pioneered the use of nylon-6 as tire cord in competition with both rayon and conventional nylon.

After the expansion is completed, Allied's output of nylon-6 is estimated to reach 75 million pounds annually. Last year Allied expanded its caprolactam monomer capacity at Hopewell, Va., to 60 million pounds, since increased to 84 million pounds. Caprolactam monomer is the starting material for nylon-6 and plastics.

"This action is our answer to the steadily growing demand for nylon-6 cord tires by passenger car owners, fleet operators, transportation companies, construction firms and all major tire manufacturers," said James G. Fox, Jr., president of the National Aniline division, which produces the nylon-6 fiber.

Long-distance turnpike driving has increased the necessity of safer high-performance tires, according to Fox. He explained that recent reductions in the price of nylon tire yarn should make nylon tires economically attractive as original equipment for automobile manufacturers.

## United Carbon Plans Plant in France

United Carbon Co., Inc., New York, N. Y., recently announced plans to form a French subsidiary and build a $5-million carbon black plant near Rouen in north central France. The new plant, to be completed early in 1961, will have an initial rated capacity of 50 million pounds per year. In choosing the location United Carbon officials consulted with French government officials, major users, and long-time customers of their carbon blacks.

Currently there is a concentration of rubber end-product manufacturing facilities in northern and central France, and further industry expansion in those areas is anticipated. Port Jerome, about 10 miles north of Rouen, offers good raw material supplies. United Carbon, by having its plant there, can serve its customers in this north and central concentration with one-day delivery if required.

Current plans are to first produce the higher grades of reinforcing blacks such as FEF, HAF, ISAF, and SAF. The plant will initially employ approximately 75 people. United blacks are currently being produced in Wales and Australia as well as in America.

## Glidden Dedicates New Research Center

The latest scientific equipment for work with pigments and other inorganic chemicals used by the paper, paint, rubber, and plastics industries is concentrated in one building in the new inorganic research and development center dedicated February 3 by The Glidden Co.'s chemical division, Baltimore, Md. Housed in a new two-story building at Glidden's Adrian Joyce Works, one of the nation's largest titanium dioxide manufacturing facilities, the center consolidates research, product development, and technical service facilities previously located in units which were scattered throughout the United States.

Viewing the papermaking industry as a potential market for its titanium dioxide, Glidden's research and development department, which has an operating miniature paper plant, contains advanced equipment which is not as yet duplicated by the paper industry itself.

Besides the paper laboratory, the center contains a paint laboratory featuring a complete range of paint making and testing equipment to evaluate pigments for the paint and printing ink industries. The laboratory will also provide finished product control of all titanium dioxide production at the Adrian Joyce Works.

The new center also contains a plastics and rubber laboratory whose function is to evaluate dispersion, opacity, and color characteristics of Glidden's Cadmolith and Zopaque pigments in various plastic and rubber materials as a means of keeping products within required specifications. Though in its embryonic stages, this laboratory contains an injection molding press, a compression molding press, a rubber mill, and mixing equipment.

Herbert L. Rhodes is manager of the new inorganic research and development center. Other laboratories executives include: A. C. Dreshfield, director of paper research; C. A. Tanner, Jr., director of development; Reuben Roseman, director of research; Richard W. Dye, supervisor of the instrument laboratory and the plastics and rubber laboratory, and George B. Taylor, who is director of the paint service laboratory.

Glidden executives present at the dedication, in addition to the laboratory heads, included George S. Warner, vice president-operations of the chemicals division; Ralph B. Quelos, general sales manager of the division; E. W. Cooper, manager of the Adrian Joyce Works; and W. K. Kelley, manager of the division's cadmium, pigment, and lithopone operations.

The new research center, located adjacent to its large production facility, will enable Glidden to provide its customers with the finest possible products and service.

## New Ameripol 4600

Development of a new, fatty acid emulsified, cold-type SBR copolymer, designated Ameripol 4600, has been announced by Goodrich-Gulf Chemicals, Inc., Cleveland, O., after a year of extensive field testing.

Ameripol 4600 is similar to 1502 type polymer except a fatty acid emulsifier is used instead of mixed fatty acid rosin soaps. However, 4600 is said to have distinct advantages: its Mooney is in the 36-48 range rather than 46-58, and it is lighter in color (owing to the sulfoxylate method of activation).

The new polymer was produced primarily to provide rubber processors with an easier processing rubber exhibiting a faster cure rate, higher modulus, and less tack than 1502. The reduced Mooney range also provides less power consumption at the processor's plant. Plastograph breakdown data show 4600 to have distinct processing advantages; after five minutes of hot plastication the Mooney of Ameripol 4600 was 33 ML, compared with 51 ML for polymer 1502. The hardness of 4600 is slightly higher than 1502 for a given cure time.

Mooney and gel data after oven aging the raw elastomers at 105° C. show Ameripol 4600 to have aging properties superior to those of 1502. The former was also found to be equal to 1502 in abrasion resistance, rebound, and hysteresis.

From the field testing results, Ameripol 4600 is believed to be suitable for use in shoe soles, floor tile, sponge, white sidewalls, sporting shoes, and household goods.

## Century Plans Growth

Century Chemical Corp., New York, N. Y., plans further expansion in 1960 and will double its gross sales to $20 million by the year's end, according to Theodore S. Hodgins, company president.

Following acquisition in 1959 of five diversified chemical companies here and abroad, Century is accelerating arrangements at all levels to expand as rapidly as possible, he said at a recent press reception. These include plans for a large international manufacturing and sales operation.

Outlining plans for the future, Hodgins reported:

"Our broad expansion goals are in the fields of nitration, chlorination, and oxidation—which means all fields of the chemical industry. We hope to make available an entire, broad line of intermediate chemicals. Some will be captive; others sold to chemical manufacturers.

"We will add new products, new product lines. Negotiations are already under way for additional research, development and production facilities which will come through integration, acquisition, mergers and construction. Plans for the consumer include ethical and proprietary drugs such as hormones, and we are also exploring patent medicines."

Century is currently manufacturing and selling various dyes. The firm is reported to have been developing pigments for use in shoe sole applications.

General officials check first tire produced by newly designed giant tire curing unit

## New Method Cures Giant General Tires

In an important technical development, The General Tire & Rubber Co., Akron, O., has simplified its method of curing giant tires. A 134-inch single giant curing unit, with half the mold attached to the lid and the other half to the base of the heater-press, recently produced its first cured tire.

This new method, according to Glenn Orr, chief engineer and designer of the heater, is the first step toward a more efficient giant tire vulcanizer. This equipment is expected to reduce substantially the curing cycle.

Using the Orr-designed heater, only 20 minutes are required to prepare a tire for curing. The previous method of preparing these giant tires and placing them into old-type pot heaters took from one to two hours per heat to get ready for curing.

With the new procedure a green tire is placed into the bottom mold, and the lid containing the upper mold is lowered on to the tire. A steel band rotates, locking the molds together.

One heater is now in active operation in the Akron plant, with installation of three more planned. They will be housed in a 4,800-square-foot specially constructed building.

## Kleinert's Breakfast

The importance of traffic to the notions department to produce volume and make a profit was emphasized by Irving Wiggs, president of Peck's, Kansas City department store, in his talk before some 1,000 merchandise managers and notions buyers at the fourteenth annual Kleinert Notions Breakfast held February 3 at the Hotel Astor, New York, N. Y. This speaker pointed out that customers returned to stores and to departments where experience has taught them that they can shop effectively, efficiently, and successfully, and that while promotional items are important, by far the greatest number of notions items are staple items.

Mr. Wiggs said that last year the national average sales check for notions was $1.58, naturally lower than the store average. He said that this can be greatly improved, pointing out that not too many years ago the average woman bought a shower cap or a swim cap for 69¢ to $1.00. Today the same department sells the same woman, or her daughter, a piece of rubber millinery retailing at $4.95 to $6.95.

Tape recordings of actual transactions in a notion's department were used by Richard M. Bleier, vice president in charge of sales, Kleinert's, to illustrate the importance of good selling techniques.

The need of well-trained sales help was also illustrated by a musical skit which closed the show. Al Kelly, the well-known double-talk comedian, entertained the audience with his impersonation of a Russian retail merchant.

## New Seiberling Plant

Seiberling Rubber Co., Akron, O., will establish a new plant in Arkansas as part of its current expansion program. Initially the plant will employ about 100 and will produce additional shoe products and other rubber goods which are now being made at the company's Ohio plants.

The new project, with total valuation of $1,300,000, probably will be built in Batesville, a city of 7,000 about 100 miles north of Little Rock. The plans call for a building of 100,000 square feet on a site of some 20 acres, with construction to begin this spring.

Pending Arkansas state legislature outcome, Batesville would issue bonds to finance the new plant and lease it on a long-term basis to a new corporation, in which Seiberling will have a substantial interest.

Seiberling said that it has been considering a new plant in the Arkansas-Kentucky-Tennessee area for three years, seeking a site with good water supply and stable work force. The area is located near major markets for Seiberling products.

## John Daley Retires

John F. Daley retired at the end of January as a vice president and member of the executive committee of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., after a career of nearly 45 years. He retains his position as a director. The board recently reduced membership of the executive committee from 10 to nine, and the number of vice presidents from nine to eight as of the time of Daley's retirement.

At the same time, Colgate W. Darden, Jr., was elected to the board, effective February 1, to fill the vacancy created by the resignation of Alfred P. Sloan, Jr. Darden has been a member of Congress and most recently the president of the University of Virginia.

Daley, who has reached the retirement age of 65, was a vice president and a member of the executive committee of the board since 1956. He had previously headed two of the company's operating departments. He was general manager of the pigments department from 1944 to 1948 and general manager of the organic chemicals department from then until he became vice president.

Starting in 1915, Daley spent his first 12 years with Du Pont in various supervisory positions in production work, with intervals in sales work, at Carney's Point, Philadelphia, Pa., and Newark, N. J., plants. He was made manager of the Newark pigments plant in 1932 and in 1935 was transferred to the Wilmington office as production manager of the pigments department.

In 1941, Daley was named manager of the Indiana Ordnance Works, Charlestown, Ind., the first ordnance installation authorized. In July, 1942, he became director of sales of the pigments department and in October of the same year was granted a leave of absence to take up the position of deputy field director of munition plants in the Office of the Chief of Ordnance.

In recognition of his war services, Daley was awarded a Commendation for Exceptional Civilian Service, by Henry L. Stimson, Secretary of War, in August, 1944.

Mr. Daley returned to Du Pont as director of pigments sales in June, 1944, became acting assistant general manager of the pigments department in August and general manager a month later. Daley was appointed general manager of the organic chemicals department in June, 1948.

## Asensio Will Head TB&C in Argentina

Lt. General Manuel J. Asensio, U.S.A.F. (retired), has joined Texas Butadiene & Chemical International, Ltd., to become chief executive officer of the Argentine company Texas Butadiene is organizing. His headquarters will be in Buenos Aires and will soon be established there.

New York Times

General Manuel J. Asensio

Texas Butadiene, a leading petrochemicals manufacturer, plans to build a petrochemical complex including a synthetic rubber plant and an adjacent butadiene plant in the vicinity of Puerto Deseado, Argentina. The Argentine Government has issued a decree sanctioning the project, and ground-breaking is expected to take place in the near future.

During his 33 years in the United States Armed Services, General Asensio spent 21 years in the Corps of Engineers. In World War II he was resident engineer in charge of the construction of the Brazilian bases along the southern route of the Air Force Ferry Command and later was Military Attache in Bogota, Colombia, before transferring to the China-Burma-India Theater. For the past 12 years he was assigned to the Air Force in the Office of the Comptroller and more recently was Deputy Chief of Staff and Comptroller of the Air Force.

## Halts Noise/Vibration

Vibra-Check, produced by Lowell Industries, Inc., Boston, Mass., is a highly efficient anti-vibrational material designed to be placed under the base of machines to prevent their transmission of vibration and noise to surrounding areas. Actual service conditions indicate that Vibra-Check will eliminate up to 90% of vibration.

Vibra-Check is composed of two layers of tough vinyl-chloride elastomeric resin, bonded to both sides of a strong reinforcing core of monofilament fiber glass. These components are fused under heat and high pressure to form a unit of three layers with three different natural frequencies. The resilient outer layers have a low density; while the hard central core has a high density. The vibrational wave meeting these three layers is isolated or absorbed. Vibra-Check is said to be resistant to moisture, oils, greases, detergents, brine, solvents, and many chemicals.

Under high shock load Vibra-Check shows no deformation or permanent set, it is claimed. Its high breaking point of 7,500 psi., its dimensional stability, and high-impact flexural and tensile strength insure its reusability.

Vibra-Check is available in sheets 22 by 23 inches, or it can be furnished cut to sizes suitable for the base or feet of any machine in such manner as to yield a unit loading of between 50 to 100 psi., the area of greatest vibration-absorptive efficiency.

Technical data on the new material are available from the company.

## Court Order Stops Tread Duplication

A federal court, in a precedent-setting move, has stopped a California tire retreading firm from duplicating the tread design of the General Dual 90, a top-quality automobile tire designed, produced, and marketed by The General Tire & Rubber Co., Akron, O.

In granting an injunction against Bay Tire Service, the U. S. District Court for the Southern District of California held that Bay Tire Service, in producing and selling a retreaded tire having a tread design similar to that of General's Dual 90, had committed acts of unfair competition.

Earlier, a number of other companies in Southern California had signed consent decrees which prohibited them from making and selling retreading matrices or retreaded tires which imitated the tread of the General Dual 90.

The court ruled that the public had come to identify the Dual 90 with The General Tire & Rubber Co. and with a high level of performance due to the entirely new and unique tire and tread construction developed by General Tire. The sale of imitations of the Dual 90, said the court, tended to dilute the good will built up by General Tire because such imitations were misleading as far as both the visual appearance and the inherent and invisible structural qualities of the tire were concerned.

In the suit General said that it had spent hundreds of thousands of dollars developing the Dual 90, that more than $35 million of the tires had been sold between August, 1956, and May, 1958, and that millions of dollars were spent advertising the Dual 90.

The General Dual 90, introduced in August, 1956, incorporates an entirely new and unique tread construction of parallel treads with a dual curvature.

Charles Mayer Studios

R. F. Wolf

## Wolf Heads Up NRB Technical Service

Ralph F. Wolf, formerly manager of compounding research, Columbia-Southern Chemical Corp., has joined the executive staff of the Natural Rubber Bureau, Washington, D.C., as director of technical service, effective February 1. The appointment reflects the broad expansion in research now being effected by the natural rubber industry according to H. C. Bugbee, president, NRB.

The new technical service department will act as the catalyst between the advances developed by the Bureau's laboratories and the effective application of these in natural usage in the United States. As a prelude to calling on manufacturers here, Mr. Wolf spent February at the Natural Rubber laboratories in England, familiarizing himself with the latest advances in natural technology. Upon his return he moved into headquarters in Akron, O.

The rubber growers of Malaya recently announced a 50% increase in the funds allocated for research and development. The additional funds are being used to expand the industry's agricultural research activities at the Rubber Research Institute in Kuala Lumpur, Malaya, and the fundamental and applied work being carried on by the British Rubber Producer's Research Association at Welwyn Garden City, England.

Bugbee reported that excellent work has been done at laboratories abroad, and the Bureau has long needed someone here who could pass on to the American manufacturing industry knowledge of what is being accomplished abroad. Superior Processing rubber is a good example. This has had some recognition and use in the United States, but not near that deserved by the efficiency it adds to extruding and calendering operations.

Mr. Wolf, who has spent his entire professional career in rubber technology, holding a number of key positions in government and industry, is well qualified to head up the strategically important new service. During the year it is expected that he will build a staff for coverage in other rubber manufacturing sections of the country.

## Firestone Names Board; Also Splits Stock

The third stock split within the last nine years for common stock of The Firestone Tire & Rubber Co., Akron, O., was approved at the annual stockholders' meeting in January. The current split is three shares for one, which was recommended by the board of directors last November.

The stockholders also authorized the enlargement of the board of directors from nine to 11 members and approved a new stock option for employes.

Harvey S. Firestone, Jr., chairman, reported the stockholders' action and also announced the retirement of H. H. Hollinger as vice president in charge of finance, and the election of E. H. Schulenberg and E. B. Hathaway to the board. Hollinger will remain a director.

In other board action, Schulenberg, present treasurer, was made vice president and treasurer; H. H. Wiedenmann, general production manager of United States and Canadian tire plants, becomes vice president for tire production; Robert P. Beasley, an assistant comptroller, was named an assistant treasurer; and John K. Smucker, manager of the budget department, was made an assistant comptroller.

The effective date for the stock split was during the last week of January. On that date the authorized number of shares of common stock was changed from 12 million shares, with par value of $6.25 per share, to 36 million shares, without par value.

In addition to the two new members, the following nine directors were reelected to the board: Harvey S. Firestone, Jr., Lee R. Jackson, Raymond C. Firestone, James E. Trainer, Leonard K. Firestone, Roger S. Firestone, John J. Shea, Mr. Hollinger, and Joseph Thomas.

The following officers were reelected: Harvey S. Firestone, Jr., chairman; Mr. Jackson, vice chairman; Raymond Firestone, president; Mr. Trainer, executive vice president; Mr. Thomas, vice president, secretary, and general counsel; Mr. Hathaway, Harold D. Tompkins, Joseph A. Meek, Louis J. Campbell, Harold M. Taylor, and John L. Cohill, vice presidents; Claude A. Pauley, comptroller; Elden H. Eaton, assistant treasurer; Henry S. Brainard, assistant secretary; Laurence Frese, and Lee R. Shannon, assistant comptrollers.

## Dixon President in Reclaimers' Election

The Rubber Reclaimers Association, Inc., New York, N. Y., recently elected new officers for 1960. President is Henry L. Dixon, who is also general manager, adhesives products, The B. F. Goodrich Co. Vice president is Donald L. McCollum, Naugatuck Chemical Division, United States Rubber Co. Secretary-treasurer is Charles T. Jansen, advertising sales manager, *Rubber Age*.

These actions were taken at the Association's annual meeting on January 27. At the same meeting T. H. Fitzgerald, Naugatuck Chemical, retiring president of the Association, was named to the executive committee where he will serve as chairman. C. H. Peterson, president of U. S. Rubber Reclaiming Co., was again named chairman of the Association's education committee. This committee works closely with local rubber groups to provide speakers for meetings and lecturers for the course in rubber technology now being conducted by various rubber groups.

E. B. Hathaway H. H. Wiedenmann E. H. Schulenberg

Edward Welch

## Foam Council Formed

The Rubber Manufacturers Association, Inc., New York, N. Y., has established a new division, which will be known as the Latex Foam Rubber Council. Heading this new division as chairman will be Edward Welch, who is also secretary of the Latex Foam Subdivision of the RMA.

Purpose of the new division is to put on an intensive public relations and promotion program on a national level to promote public recognition of the superiority of latex foam as a bedding and cushioning material. The program is planned to be of three years' duration and will be under the direction of the public relations firm of Doherty Associates, Inc., New York. The program will be a combined effort of manufacturers of latex foam products and suppliers of natural and synthetic latices. The campaign will be directed at both homemakers and makers of upholstered furniture, bedding, and other cushioning users.

## Test Truck Tires Of Tyrex Construction

Tyrex, Inc., New York, N. Y., a voluntary non-profit association of Tyrex tire cord producers, reports that rigorous truck tire tests conducted during the past summer and fall utilized tires made with both Tyrex tire cord and nylon, resulting in 16.8% more tread life for truck tires made with Tyrex cord. A total of 1,945,600 tire miles was rolled up during the testing, which was conducted by an independent test organization. Reports showed less tire growth with Tyrex cord, resulting in better tire balance and less trouble with matching tires in dual mountings, according to Tyrex officials.

Test tires were the same as are commercially available to truckers currently in 1000x20 sizes. The trucks operated on regular highways as opposed to special test courses. Tire rotation was scheduled so that each tire of one type was compared with a tire of a different type operated in equal miles under as nearly identical conditions as possible. Trucks were driven 800 miles a day at cruising speeds of 50 miles per hour.

To complete the testing of Tyrex tire cord, Tyrex officials have revealed that an additional 2,860,800 tire miles have been rolled up so far in follow-up commercial fleet tests in Texas. While final figures are not yet available, this series of daily runs indicates even greater advantages for tires made with Tyrex cord, according to Tyrex officials.

## New Crown Foam Plant

Crown Rubber Co., Fremont, O., has announced a major expansion program designed to quadruple production, according to Robert P. Johnson, general manager. The program includes the erection of an additional plant, a modern brick building which will provide an additional 52,000 square feet of work area, as well as the installation of a large modern foam machine.

The expansion is necessitated by the rapid sales growth. Each month of 1959 exceeded the corresponding 1958 month, and new sales records were established each month during the last quarter of '59.

The new plant will be located on 20 acres by a four-lane highway just north of Fremont. It is a central location for Crown's supplies and markets, close to the Ohio Turnpike for trucking and immediately accessible to railroads.

The new plant will house a modern foam unit engineered to give precision processing. The unit will utilize processes being brought in from Europe which will enable Crown to produce more foam coated fabric than any other manufacturer in this country. This unit, moreover, will handle 13-foot material and will have the fastest put-through rate in the industry.

Physical design of the new building is modern and functional. It will be completely fireproof and will have an exterior of brick and glazed tile. Completion date is anticipated for July 1.

B. F. Goodrich Co. executives *(left to right:* E. F. Tomlinson, president, B. F. Goodrich Tire Co.; Daniel Pellet, Goodrich director of engineering; Wm. W. Scull, Goodrich vice president-manufacturing; Walter E. Head, Goodrich Tire vice president-manufacturing) inspect a section of a scale model of a 850,000-square-foot modern tire manufacturing plant to be built near Fort Wayne, Ind. The plant, which will employ about 1,000 when in full operation, will produce most types and sizes of passenger-car, truck, and farm implement tires. It will include the latest applications of automation and will stress precision quality-control methods. Raw materials will enter at one end of the building and after due processing will emerge at the other end as finished products.

## Wink Cutters To Be Shown by Tornquist

The Wink high-speed rubber cutting machines, made by Motch & Merryweather Machinery Co., Cleveland, O., will be demonstrated in action at the Tornquist Machinery Co., 3825 Santa Fe Ave., Los Angeles, Calif., during an open house, March 21-26. During the following week, Tornquist, who is the authorized distributor for the Wink Cutter, will continue demonstrations on an individual appointment basis.

The Wink Cutters have proved extremely successful in providing high-speed cutting to very accurate dimensions and with controlled feed for a wide variety of materials, in diameters up to three inches, without distortion or collapse. Materials include rubber, soft plastics, impregnated fabrics, reinforced hose, fibers, and other materials. The Wink machine is said to be especially suited for precise cutting of extruded materials and may be incorporated easily into a completely automated extrusion line. For the smaller producer it offers the advantage of practically complete automation in a single package.

At the Tornquist open-house demonstration, Motch & Merryweather representatives demonstrated performance on a variety of materials. Manufacturers were invited to bring their own sample stocks for cutting tests.

Further information on the Wink Cutter is available in Bulletin W-100 from Motch & Merryweather Machinery Co., Wink Cutter division, 1250 E. 222nd St., Cleveland 17, O.

## New Study on Tire Fatigue Failure

A recent research program conducted by Fabric Research Laboratories, Inc., Dedham, Mass., casts doubt on the theory that tire fatigue failure in nylon or viscose cord is caused by a gradual loss of cord strength proportional to tire mileage. This study, conducted by W. G. Klein, M. M. Platt, and W. J. Hamburger, of FRL, was reported at the February 24 meeting of the Technical Association of the Pulp & Paper Industry, Hotel Commodore, New York, N. Y.

The report was in effect a progress report on a continuing research aimed at delineating the nature of cord fatigue in tires. The first stage of this study dealt with the properties of cords and filaments removed from tires run on a New York taxi fleet. The major emphasis was on tires constructed of Tyrex viscose cord, but corresponding studies were also made on a smaller group of nylon-cord tires.

Some previous work on this problem indicated that a linear degradation of cord tensile strength with mileage might be anticipated and implied that the rate of change of cord tensile strength could be taken as a measure of fatigue resistance. The current studies reported by Klein and performed on the tires from this test indicate that: (1) there is an initial loss of cord strength of about 10-15%, occurring within the first 20,000 miles, followed by a long period of very gradually diminishing strength; (2) while there is a trend for a small loss in fiber strength with mileage, it is not correlative with cord strength losses; (3) the strength loss in the few severely weakened cords found was attributable to filament breakage; (4) no unusual strength losses were observed in intact cords from tires classified as fatigue failures.

For the tires studied, reported Klein, it is not possible to establish differences between Tyrex viscose and nylon in fatigue since the number of failures was small, and all occurred at high mileages. Similarly, rates of degradation of tensile strength of cords containing either fiber type could not be distinguished from each other.

# NEWS BRIEFS

**THE GOODYEAR TIRE & RUBBER CO., Akron, O., during February raised replacement tire prices 3%** on certain of its passenger tire lines and from 3-5% on most truck tires, attributing the increase in price to increased labor and raw material costs. Other increases included 3% on farm and implement tires, 3% on industrial pneumatic tires and tubes, and 5% on truck tubes in larger sizes. Other tire manufacturers are expected to follow in line. The increase by Goodyear was termed by industry spokesmen "justified" by advancing raw material and labor costs.

**MARTIN RUBBER CO., INC., Long Branch, N. J., manufacturer of molded, extruded, and lathe-cut soft rubber goods, has purchased the toy tire department** from Auburn Rubber Co., Auburn, Ind. Martin enters this field with 64 different sizes of stock molds, and the firm is in a position to handle requirements on toy tires from the smallest to the largest sizes. Some of the tires are smooth, but many have treads and lugs. At its location in Long Branch, Martin is centrally located for deliveries to all eastern toy manufacturers.

**ACME BACKING CORP.'S industrial products division, formerly at the mill in St. Louis, Mo., has moved to the company's general offices in Stamford, Conn.** Coated and laminated industrial fabrics now made at the St. Louis plant will still be processed there, but sales activities will be conducted from Stamford, where Lee R. Jacobs, manager, now makes his headquarters.

**HARCO LABORATORIES, INC., New Haven, Conn., manufacturer of a complete line of temperature and pressure-sensing devices and equipment, has appointed four new field sales representative organizations.** C. M. Sallee & Associates, Atlanta, Ga., has been assigned the states of North and South Carolina, Georgia, Mississippi, Alabama, and Florida. The John W. Richardt Co., Pine Brook, N. J., will cover northern New Jersey, southern New York State, and metropolitan New York. The Hyde Electric Co., Denver, Colo., will handle Idaho, Montana, Wyoming, western Nebraska, Utah, Colorado, Arizona, and New Mexico. The Electronic Applications Co., Syracuse, N. Y., will cover northern New York State.

**THE OKONITE CO., Passaic, N. J., is now using neoprene synthetic rubber to make welting** which will further increase the resistance of shoes to attack by oils, grease, moisture, and chemicals. Welting—the narrow strip used to attach the sole to the upper by stitching or the new "molded on" process—is critical in the overall wear-life of a shoe. The tough neoprene compound, which is being adopted by leading shoe manufacturers, is soft enough that it will not cut the stitching, and flexes compatibly with synthetic and natural rubber soles, reducing strain on stitches. The welting is available in standard flat welting, two types of "storm beads" for extra weather protection, and a special type for use with new "molded on" soles. Neoprene is supplied by the E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

# Traveling Companion

**Whitewall tires with Glidden Zopaque® Titanium Dioxide withstand weathering, scrubbing and scraping ...stay white longer**

The fresh, showroom appeal of whitewall tires lasts for life when they are pigmented with Glidden Zopaque.

Zopaque provides high hiding power and tinting strength and maximum opacity, qualities which stand up under the most adverse conditions. Zopaque also disperses readily.

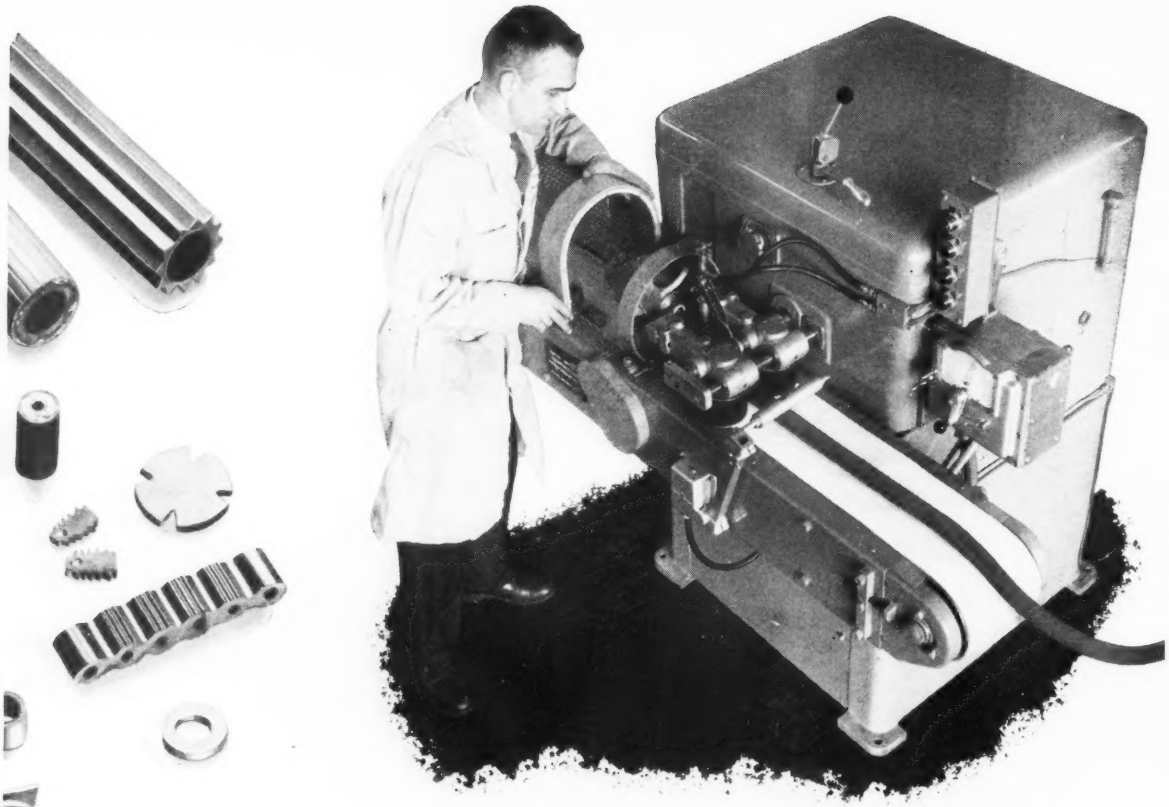
Write now for complete information on how Glidden Zopaque Titanium Dioxide can help you produce highest quality whitewall tires and other fine rubber products.

QUALITY Glidden PRODUCTS

**FINEST PIGMENTS FOR INDUSTRY**

**The Glidden Company**
**Chemicals—Pigments—Metals Division**
**Baltimore 26, Maryland**

*(This advertisement is printed on paper stock containing Glidden ZOPAQUE Titanium Dioxide.)*



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Cleveland 17, Ohio

MOTCH AND MERRYWEATHER

**THE DOW CHEMICAL CO., Midland, Mich., has announced plans for a major increase in styrene monomer production capacity** which will bring Dow capacity to more than 800 million pounds per year. Completion is expected by late 1960 or early 1961. Capacity expansion involves both the Dow Texas division at Freeport and the Midland division. Dow uses its own styrene in new coatings, foams, films, plastic molding materials, and ion exchange resins. Dow also sells styrene to the chemical and other industries for uses including the manufacture of SBR, polyester resins, and of polystyrene and many other polymers and copolymers.

**BEEBE RUBBER CO., Nashua, N. H., manufacturer of the Ripple sole and other products, has announced a plant addition and installation** of larger and more modern equipment. A new 2½-story section contains 6,000 square feet of ground floor space plus overhead working and storage areas. New equipment includes a Banbury No. 11 mixer, an 84-inch Farrel-Birmingham mill, an automatic Akron-Standard batch-off machine, and a semi-automatic compounding machine. Beebe also is completing a new laboratory which will be used for quality control, research and development of new products for the footwear field. Dana Sanders is in charge of laboratory development. Newly associated with Beebe are George Sadler, laboratory manager, and Coleman Costello, laboratory control and factory procedure manager.

**THE DAYTON RUBBER CO. announced plans to move its urethane foam cushioning production** from Marietta, O., to Waynesville, N. C., starting in February, according to L. C. Pape, vice president of Dayton Rubber's Koolfoam division with headquarters in Asheville, N. C. Dayton Rubber has a major plant in Waynesville making foam latex, furniture cushioning, mattresses, and pillows plus a variety of products for the industrial and automotive fields. The move is the first step in the company's program or urethane expansion. It intends to locate other urethane plants in key market areas for improved customer service.

**UNION CARBIDE PLASTICS CO., division of Union Carbide Corp., has established a new sales office** in the Guilford Building, Room 712, Greensboro, N. C. C. S. Shoemaker, a technical representative in the company's South Atlantic Region since 1950, will be located in the new office. He will handle the sale of all epoxy, polyethylene, phenolic, styrene, and vinyl resins and compounds marketed by Union Carbide Plastics with the exception of those used in the flexible packaging and wire insulating industries.

**WYROUGH & LOSER, supplier of chemicals and processing aids to the rubber industry, has announced a change in address,** effective February 29. The new address is 2 Brunswick Circle Extension, Trenton 8, N. J. The telephone number remains the same: LYric 9-2531.

**THE GOODYEAR TIRE & RUBBER CO., Akron, O., recently displayed what was claimed to be the world's largest and most durable dock fender,** a giant tube of synthetic rubber said to withstand impacts of nearly 300,000 pounds per foot. The new fender, displayed at the forty-eighth annual conference of the American Association of Port Authorities, Inc., at West Palm Beach, Fla., was part of the first full-scale exhibit of port equipment shown in conjunction with the annual meeting. The fender is 21 inches across the outside diameter and 10½ inches on the inside diameter. A one-foot section weighs 135 pounds and will absorb 45,700 foot-pounds of kinetic energy. The fender virtually eliminates damage to piers and mooring posts caused by the crushing weight of docking ships. The fenders are extruded and contain a mildew inhibitor and chemicals which resist deteriorating action of salt water, ozone, sunlight, and marine bacteria.

**COOPER TIRE & RUBBER CO., Findlay, O., recently leased a plant of approximately 140,000 square feet at Auburn, Ind.,** formerly occupied by Auburn Rubber Co. Cooper expects to start production operations there in the near future. The plant is equipped to manufacture industrial rubber products, enabling Cooper to more than double its production of these items. Cooper's expanding sales of both tires and industrial rubber products, which are produced at Findlay, have created need of additional production facilities. The Findlay plant is presently being expanded for additional tire production. Inner tube and camelback requirements are produced at its plant in Clarksdale, Miss. Cooper also obtained an option to purchase the Auburn plant at any time during the term of the lease on very favorable terms.

**McKESSON & ROBBINS, INC., reports that its chemical department has established a new chemical sales branch and warehouse at Saginaw, Mich.,** located in the Bearinger Building. Harold McAdow, former manager of the Cincinnati chemical branch, has been appointed branch manager of the new unit. These facilities will provide prompt service to customers in the area and will satisfy the growing industrial chemical needs of northeast Michigan industry. The department distributes more than 700 heavy and fine industrial chemicals and feed supplements.

**THIOKOL CHEMICAL CORP.'S reaction motors division received the Borg-Warner annual award** this year for achievement in the field of missiles and astronautics from R. S. Schutz, executive vice president of the Ingersoll-Kalamazoo division, Borg-Warner. The award, a three-foot-tall silver trophy, was awarded for the successful development and production of the packaged liquid propellant missile engine known as the Guardian I and the Guardian II. Presentation of the award was made at the Goddard Memorial Dinner in Washington, D. C., February 17, climaxing the National Missile Industry Conference.

**THE B. F. GOODRICH CO. and Bell and Howell were cosponsors of the TV show, "CBS Reports," which received two 1959 Sylvania television awards** in the field of international and human relations in the ninth annual ceremonies held recently in New York. The "CBS Reports" show, "Biography of a Missile," received a statuette for the outstanding documentary program; and "The Population Explosion" program in the same series received an award as the outstanding public service program. Don C. Miller, vice president-marketing at Goodrich, accepted a citation on behalf of the sponsors.

**THE TOOL STEEL GEAR & PINION CO.,** Cincinnati, O., has purchased through a wholly owned subsidiary, the Badall Engineering & Mfg. Co., Hammond, Ind. The latter company produces high-quality hardened iron, steel and tubular rolls which are sold to steel mills, paper mills, plastic manufacturers, rubber plants, and other industries. Operations will continue at the Hammond plant under the name of The Badall Co., Inc.

**THE GOODYEAR TIRE & RUBBER CO., Akron, O., prompted by record-breaking success on the Salt Flats at Bonneville, Utah, plans to enter the land-speed-record tire field in 1960.** Tony Webner, racing director for Goodyear, reports that the LSR tires will be produced in four sizes: 5.50-15, 6.75-16, 8.00-18, and 7.00-21. The tires will be constructed on a confirmed, prepaid order basis and shipped approximately six weeks after receipt of the order.

**EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Co., New York, N. Y., has reduced the price of its neopentyl glycol (2,2-dimethyl-1,3-propanediol) 5¢ a pound.** At the new price of 32¢ a pound for carload drums (33¢ l.c.l.) Eastman expects to expand considerably the market for neopentyl glycol in the broad area of polyesters including polyurethanes, plasticizers, and alkyd resins.

**AMERICAN CYANAMID CO'S intermediates department, Bound Brook, N. J., will produce commercially 1,4-naphthoquinone** early this spring. The chemical is a highly reactive, aromatic, bifunctional chemical that undergoes both addition and substitution reactions at its 2- and 3-positions with a variety of chemicals. Its reaction product, 1,4-naphthoquinone dioxime, is a vulcanization agent for butyl rubber and a polymerization inhibitor and stopping agent for SBR. Suggested uses for pure 1,4-naphthoquinone include its use as a polymerization regulator for synthetic rubber and polyester resins and as a stabilizer for transformer oils.

**THE GOODYEAR TIRE & RUBBER CO., Akron, O., has manufactured a special passenger belt** which is installed in a moving sidewalk in an ultra-modern department store in Lucerne, Switzerland. Capable of carrying more than 7,000 passengers per hour, the "Speedramp" connects a basement supermarket in the Innovation Department Store with the building's main entrance. The passenger conveyor-belt system was engineered and built by Stephens-Adamson Mfg. Co., Aurora, Ill. This "Speedramp" was erected as a unit in the United States and shipped overseas to be installed.

**THE FIRESTONE TIRE & RUBBER CO., Akron, O., is said to be the first rubber company to start a program** which makes it possible for its dealers and stores to give a nationwide guarantee on retreaded tires. The guarantee applies to tires retreaded with Firestone tread rubber with Firestone tread designs and identified with Firestone quality medallions. Firestone quality tread medallions will be applied to all passenger and truck retread tires in all sizes and types when Firestone quality materials have been used according to Firestone workmanship standards.

**JEFFERSON CHEMICAL CO., INC., Houston, Tex., has acquired extensive chemical manufacturing facilities from Gulf Oil Corp.** at Conroe, Tex., about 40 miles north of Houston. The plant, located on an 85-acre tract, consists of seven processing units operated from two control rooms, a process building containing equipment for handling both liquids and solids, hydrogen unit, control laboratory, shipping and receiving facilities, five boilers, two cooling towers, three wells, waste evaporation ponds, office building, and other general plant equipment. Development of a new process for morpholine, an intermediate used in rubber chemicals and corrosion inhibitors, will be undertaken at the Conroe operation. In the future Jefferson plans to produce intermediates developed for use in the polyurethane resin industry and certain specialty surface-active agents.

**THE RICHARDSON CO., Melrose Park, Ill., a leading manufacturer of industrial rubber and plastic products, is continuing its expansion** into the chemical marketing areas, with its second major purchase within a 30-day period. A newly formed subsidiary of Richardson, called Treplow Chemical Co., has acquired for cash the assets of Treplow Products, Inc., Paterson, N. J., a company producing organic chemicals and synthetic resins for use in the detergent, textile, cosmetic, laundry and dry cleaning industries. The first acquisition, last December, was Richardson's purchase of a majority interest in The Plastics Corp. of America, manufacturer of polystyrene molding and extruding resins. Both purchases are part of Richardson's active plan for growth and diversification in the chemical processing field.

**AMERICAN HARD RUBBER CO., a division of Amerace Corp., is building a new, highly automated plant for manufacturing bowling balls in Booneville,** Ark. Representing an initial investment of more than $2 million, the facility is being erected adjacent to the plant which AHR constructed in 1955 to manufacture Ace hard rubber combs. When production begins, by late summer or fall of this year, AHR's bowling ball production capacity will be more than doubled. The company is one of the leading manufacturers in the field and has been a pioneer in the manufacture of bowling balls since the early part of the century.

**DAYTON INDUSTRIAL PRODUCTS CO., Melrose Park, Ill., has developed a practical wrap-around press blanket** for use in newly developed rotary letter-press applications. The new blanket uses a special rubber-vinyl-resin face compound for superior ink receptivity and low swell. The new face compound also offers high resistance to ozone, heat, oil and grease, and abrasion. This new blanket is an integral part of a new concept in letterpress operations which permits higher press speeds and substantial reduction in makeready time, using new wrap-around letterpress plates and direct-paper printing.

**POLYMER CORP., LTD., Sarnia, Ont., Canada, reports that expenditures of $6.1 million** are anticipated in its 1960 capital budget. Of the total budget, $4.7 million are provided for capital items related to improvement of production units, and the continuance of work on the program of solution polymers and specialty types of rubbers. Included also is provision for the regular, planned extension of employe facilities, and further work in connection with the prevention of air and water pollution. A sum of $1.4 million is carried forward for completion of projects started in previous years.

**STEWART BOLLING & CO., INC., Cleveland, O., manufacturer of rubber and plastic processing machinery, mills, intensive mixers, calenders, hydraulic presses, extruders, and related equipment, has appointed Clarke Associates,** 13 Happy Hollow Rd., Wayland, Mass., sales representative covering the New England territory. Included are Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. Telephone is Wayland, Mass.-Elmwood 8-2626.

**GENERAL LATEX & CHEMICAL CORP. OF OHIO is planning for the immediate production and sale of resin and dextrin adhesives** to serve industries in Ohio, Michigan, Indiana, Kentucky, and Illinois. The Ohio plant, located in Ashland, is one of six divisions of this rapidly expanding chemical firm. This move is the beginning of the firm's plans to produce all types of adhesives in its Ohio, Georgia, North Carolina, Massachusetts, and Canadian plants. New personnel at the Ashland plant include Donald J. White, head of the adhesives laboratory, and Charles Smith, sales representative.

**BAKER PERKINS INC., chemical machinery division, Saginaw, Mich., is offering a new 40-inch model high-output universal centrifuge** for removing from a liquid carrier solids such as polyolefins, vinyl resins, cornstarch, titanium, aspirin and acrylic resins. When processing free-draining materials, capacities up to 30 tons per hour are possible. The HS 40 W universal, as the machine is called, is powered by a 75-horsepower motor to provide a maximum drum speed of 1300 rpm. Capacity of the drum is eight cubic feet. The complete machine occupies a floor space of about 10½ by 9 feet. It handles materials under 150 psi. internal pressure while operating at speeds of 1,000 Gs.

**TRACERLAB'S radiochemical department, Waltham, Mass., has announced the availability of six new radiochemical compounds including Propylene 1-C$^{14}$.** Propylene is the monomer of the important new plastic polypropylene, and this radioisotope is useful in determining its chemical reactions and metabolic fate.

**BALL BROTHERS CO., INC., Muncie, Ind., has purchased Atlantic Zinc Works, Inc., and its subsidiary Rolled Plate Metal Co., Brooklyn, N. Y.** The Ball company manufactures glass containers, decorative plastics, mechanical rubber goods, closures, and nonferrous metal products. Atlantic Zinc Works and Rolled Plate Metal Co., which will continue under the presidency of Fred A. Dirkes, are leading producers of photoengravers' zinc alloys for the graphic arts industry.

**GEORGE A. WILLIAMS & SON, New York, N. Y., has reduced the price on all wire cloth and extruder pack screens.** This reduction in price is attributed to the fact that new machines in the cutting department, with resulting increased efficiency, have appreciably reduced overhead expenses. Users of woven wire cloth materials are urged to request the new price schedule from the manufacturer.

**THE FIRESTONE TIRE & RUBBER CO., Akron, O., has developed a new single truck tire,** as yet unnamed, to replace duals on tractor-trailer rigs. This unusual new tire is nearly twice as wide as a conventional tire, and its load-carrying capacity exceeds that of the two tires it replaces. The new 18-19.5 tire and its rim weigh 286 pounds, compared to 410 pounds for the 11-22.5 dual assembly. Other advantages cited include: less unsprung weight, lower spring rate, softer ride, less space required, fewer parts, greater safety, sharp reduction in sidewall damage, and greater off-the-road mobility. Quantities of the tires are now in use for evaluation on commercial trucking fleets.

**GOODYEAR FOUNDATION, a non-profit corporation supported by the Goodyear Tire & Rubber Co., Akron, O., has awarded** $5,000 to the American Institute for Foreign Trade, according to Arden E. Firestone, secretary of the Foundation. The Foundation also provides $1,000 scholarships to students in technical and non-technical schools across the country.

**MIDWEST RUBBER RECLAIMING CO. has opened an additional reclaiming plant in Chester, Pa.,** bringing to four the number of production facilities the firm has operating at strategic points across the nation. Joseph Wilson has been named plant superintendent. Ralph Kniepkamp will serve as office manager and will have charge of traffic and purchasing. Ronald McEntire will handle the Chester technical activities. Other plants are located at East St. Louis, Ill.; Barberton, O.; and Paramount, Calif.

**THE FIRESTONE TIRE & RUBBER CO., Akron, O., has designed and built special wheels and tires for a jet-powered race car** which will make an assault on the land speed record this summer. Nathan Ostich, Los Angeles physician who will pilot the car, expects to hit speeds up to 500 miles per hour at the Bonneville Salt Flats in Utah. The tires, designed for speeds up to 600 miles per hour, have been built and are now undergoing laboratory tire tests. The special high-speed tires measure 48 inches in diameter and have a nine inch cross-section. They are constructed of nylon cord.

View of "inflatable landing gear" of Mace missile

**THE GOODYEAR TIRE & RUBBER CO.'S aviation products division, Akron, O., is manufacturing rubber-coated inflatable fabric airbags for use by the Air Force.** Two of these bags serve as landing gear on the Mace missile to permit recovery of the vehicle. Two recovery bags fit snugly around the belly of the vehicle and are popped into shape by compressed air during a landing. The bags cushion the Mace during landing and are a vital part of the recovery system used in returning the missile to the ground without damage. The Martin Co., which builds the Mace missiles, has placed an order for 96 landing bags.

**THE LATEX FOAM RUBBER COUNCIL, New York, N. Y., reports that the model Family Fall-Out Shelter** at the National Design Center in New York featured latex foam rubber mattresses and cushions in its double-deck bunks and compact seats. Civil Defense officials, who check all bedding, furniture, and other recommended emergency household equipment selected for the model shelter, indicated that the latex foam rubber was recommended because of its lightness, coolness, and odor-free qualities. They also pointed out that the durability, comfort, and mildew and vermin-resistant qualities of latex foam rubber make it practical for fall-out shelter use as it has proved to be for the past 30 years in quality bedding and upholstered furniture cushioning.

**MINNESOTA RUBBER CO., Minneapolis, Minn., has expanded its laboratory facilities** with the recent addition of an electronic micro-hardness tester which can detect minute variations in the hardness of rubber, making possible the checking of hardness of extremely small parts, parts with very thin cross-sections, and parts with irregular shapes. The tester makes it possible to control more closely the production of rubber; so there is a minimum of variation in physical characteristics in the end-product.

**GODFREY L. CABOT, INC., Boston, Mass., producer of carbon black and chemicals, through a modification and expansion program** now being completed at four of its southwestern carbon black plants, will add 110 million pounds per year to its present production of oil furnace blacks for domestic consumption.

**THE BORDEN CHEMICAL CO.** has purchased 26.8 acres in Fremont, Calif., to be used as the construction site for its recently announced 90-million-pound-per-year resins and formaldehyde plant. Ground-breaking ceremonies were held on January 27 at the site by E. J. Sullivan, executive vice president, R. T. Linehan, western sales manager, and R. T. Hanson, general manager, West Coast operations, The Borden Chemical Co. The resins plant is tentatively scheduled for completion in April, 1960, and the formaldehyde plant in the fall of this year.

**FIRESTONE INDUSTRIAL PRODUCTS CO., Akron, O., reports that its Airide suspension is being featured on General Motors Corp.'s new DLR-8000 and DFR-8000 highway tractors.** Utilizing a new type of stabilized Airide, independent front wheel suspension, fabricated frames, and aluminum tilt cabs, the new highway haulers have achieved major breakthroughs in light weight and safety design. The new stabilized Airide features a fast-recovery piston-type air-spring and leveling valve at each wheel. A new type of convolution air springs replaces the former double convolution air bellows, eliminating the need of an air reservoir tank to obtain the desired ride characteristics.

**PATERSON PARCHMENT PAPER CO., Bristol, Pa., has developed a new type of Patapar releasing parchment** which is release treated on one side and gluable on the other side for applications requiring both release and adhesion. Applications include the manufacture of plastic laminates and the packaging of tacky industrial products, such as crude rubber. Because the new parchment can be dry-stripped on its releasing side, it can be used as the inner liner of bags used in packaging synthetic rubber and other tacky materials. Made in this manner, the bags feature a release interior to facilitate emptying of the contents.

**SINCLAIR OIL CORP. and KOPPERS CO., INC., recently announced plans to build a large modern petrochemical plant** at Houston, Tex. The new plant will produce styrene monomer, a basic chemical used in the manufacture of plastics, synthetic rubber, latex, and other products. Completion and initial operation are expected by mid-1961. Styrene output is estimated to be 70 million pounds per year.

**U B S CHEMICAL CO., Cambridge, Mass., has set the latter part of March as the target date for the completion of additional construction** of its polymer plant in Lemont, Ill. Although this plant's production is presently confined to the making of polystyrene based polymer emulsions, it is being considered as a source for the manufacture of acrylic based polymers and copolymers. Most of the expanded area at this plant will be devoted to increased warehouse and storage facilities. Included are two additional tank-wagon loading platforms and two tank-car filling stations.

**ORONITE CHEMICAL CO., a subsidiary of the Standard Oil Co. of California, has created a special division** to sell petroleum and rubber chemicals. To be known as the petroleum and rubber chemicals division, the new sales segment will offer such products as butadiene, catalysts, odorants for oil and gas transmission companies, high-temperature hydraulic fluids, and lubrication oil additives. Oronite has also formed two other new sales divisions: the surface coatings and plastics chemicals division and the industrial chemicals division. Heading the new petroleum and rubber chemicals division will be J. R. Sitt, headquartering at Oronite's home offices in San Francisco, Calif.

**THE GOODYEAR TIRE & RUBBER CO., Akron, O., is using a process called "tractionizing" on its new Suburbanite winter tires** which gives a highly flexible, crepe-like quality to the top, road-contacting surface of the tread by putting thousands of tiny holes in the tread. In "tractionizing," not a new process in itself, the cured and molded tire is mounted on a machine which presses on the tread surface with four small "tack"-studded wheels. The tire is rotated for several seconds, and the studded wheels punch an even pattern of holes into tread rubber specifically compounded for that treatment. The Suburbanite is available in 13-, 14-, and 15-inch sizes, black or white walls, with Goodyear's exclusive 3-T nylon or rayon cord.

**INTER - INDUSTRY HIGHWAY SAFETY COMMITTEE has changed its name to the Auto Industries Highway Safety Committee** and is now located at 2000 K St., N.W., Washington 6, D.C. The announcement was made by Charles C. Freed, chairman of the board of directors, at the committee's annual luncheon-meeting, held in conjunction with the NADA convention in Washington recently. The Committee is sponsored by these groups: Automobile Manufacturers, the National Dealers Association, Tire Manufacturers, and the National Tire Dealers & Retreaders Association.

**DOW CORNING CORP., Midland, Mich., reduced prices approximately 25% on all its Silastic LS (fluorosilicone rubber) stocks,** effective February 1. This reduction drops the price of these fuel-, oil-, and solvent-resistant silicone rubbers to $12 a pound. The rubber materials affected by the price cut are Silastic LS-53 and LS-63 stocks and Silastic LS-422 Base. Consumption of fluorosilicone rubbers has doubled in the last year. The price reduction applies only to fluorosilicone rubbers.

**THE PANTASOTE CO., Panta-Pak division, New York, N. Y., reports that its poly(vinyl chloride) candy tray has been cited** as one of the outstanding examples of modern packaging in New York's Museum of Modern Art's new catalog. The catalog contains photographs of 53 of the nearly 150 packaging innovations included in a two-month exhibition at the Museum late last year. The candy tray, a vacuum-formed tray molded to the shape and size of assorted candies, is one of a number of Pantasote custom-designed trays and packages.

**SEIBERLING RUBBER CO., Akron, O., recently increased prices of its passenger and truck tires.** The increases range from 3% on most lines of passenger tires to 5% on large truck tires and tubes. Prices of its premium priced puncture-sealing tires were increased 7½%. The increases were attributed to the high cost of raw materials and labor.

**PELMOR LABORATORIES, INC., Newtown, Pa., is now marketing solutions based on Du Pont's "Viton" synthetic rubber** in a variety of colored and black solutions. The excellent heat resistance, ozone resistance, and resistance to oils, fuels, solvents, and other fluids for which "Viton" is noted can now be imparted to insulations and coatings where molding is not desirable or physically possible. "Viton"-based solutions in yellow, red, green, blue, neutral, gray, and black are available in five-gallon, one-gallon, and quart containers. Suggested applications are in the areas of calking, sealants, coatings, commercial fabric linings, wire insulation, color-coding, etc.

# NEWS about PEOPLE

**Paul S. Stutsman** becomes manager of butadiene operations for Texas-U.S. Chemical Co., New York, N. Y. Dr. Stutsman formerly was assistant to the president, **A. K. O'Keefe.**

**Charles F. Peterson** becomes manager of organic chemicals, western division, for Dewey & Almy Chemical Division, W. R. Grace & Co. He will make his headquarters in Los Angeles, Calif., and will be in charge of sales in 11 western states.

**William H. Magill** has been made administrative assistant to **Laurel G. Parkinson,** general manager, marketing, Amoco Chemicals Corp., Chicago, Ill. Previously Magill held the position of product technologist in the petroleum additives division.

**Zenas W. Bliss** has been appointed manager of silicone rubber and specialty products for Haveg Industries, Inc., Taunton Division, Taunton, Mass.

**Kenneth L. Edgar** has been named vice president, and **Stuart G. Keiller,** sales manager, of the new Hopewell, Va., plant of The Firestone Synthetic Fibers Co., a division of the Firestone Tire & Rubber Co. Edgar's new position is an addition to his present duties as vice president of The Firestone Plastics Co., Pottstown, Pa.

**Howard Shannon,** president of Supplex Co., Garwood, N. J., has been named president of American Hard Rubber Co., New York, N. Y. Both companies are divisions of Amerace Corp. Shannon will retain his post with Supplex.

**Victor Conquest,** vice president, has been named European representative of Armour & Co., Chicago, Ill., with offices in Paris, France. He will supervise the Armour research and development activities now being conducted with universities and private industry in western Europe and Great Britain.

**John A. Meintjes** has joined Phillips Petroleum Co. as a technical sales engineer in the company's international department and will be located in New York, N. Y. He will deal with customers and prospects for carbon black and synthetic rubber throughout the world, especially in South America. Prior to this assignment he was with G. J. Wevell, Pty., Ltd., agent for Phillips in its South African operations.

**E. E. Gale** will direct a new staff group within the marketing division of Polymer Corp., Ltd., Sarnia, Ont., Canada, according to **R. E. Hatch,** vice president, marketing. **H. A. Pfisterer,** previously supervisor of the rubber technical service laboratory, will also transfer to the new group. The new organization will be responsible for all marketing aspects of new product planning and development and for the maintenance of a continuing liaison between the marketing and the research and development divisions.

**George A. Mentzer** has been named manager of trade advertising and sales promotion for B. F. Goodrich Chemical Co., Cleveland, O., and will be in charge of the company's public relations and technical literature programs, in addition to advertising and sales promotion. He succeeds **George B. Koch,** who recently advanced to a managerial post in the new corporate advertising group at Goodrich.

**Harold R. Horner, Jr.,** has been appointed Conroe plant manager for Jefferson Chemical Co., Conroe, Tex. The new plant, recently acquired from Gulf Oil Corp., will be used for intermediate scale production of new products and for large-scale development work on new processes. Horner formerly held the position of assistant to the general manager, research and development.

**C. E. Leach** has been elected vice president, industrial relations, of Texas Butadiene & Chemical Corp., Houston, Tex. He formerly held the position of director of industrial relations.

**William Moorehouse** has been advanced to senior engineer at the Akron, O., chemical plant of B. F. Goodrich Chemical Co. He has been with the company since 1942.

**Ralph L. Tucker** fills the new position of manager of tile flooring products for Ruberoid Co., New York, N. Y. The post was created with Ruberoid's recent entry into the resilient floor covering field. The company will distribute, under its own brand name, floor tile products manufactured by its Mastic Tile division. Tucker was previously associated with that division.

T. A. Robertson W. Shakespeare

**T. A. Robertson** becomes manager of tire engineering and development for The Firestone Tire & Rubber Co., Akron, O. He was formerly manager of tire engineering. In addition, **R. P. Powers** is now manager of tire testing and advance engineering; while **R. H. Finefrock** has been named sales engineer. **C. T. Reynolds** has been promoted to manager of mileage tire development, and **J. H. Cox** has been made manager of sales engineering, truck tires. **D. A. Clendenen** is now manager of manufacturers sales engineering. **E. W. Mitchell** has been appointed senior compounder, steelcord and mileage tires.

**J. Porter Brinton, Jr.,** has been elected a director of Witco Chemical Co., Inc., New York, N. Y. He continues as chairman of the boards of two recently acquired, independently operated Witco subsidiaries: Tar Distilling Co., Inc., and Old Colony Tar Co., Inc., both of which he founded in the early 1930's.

**Jerome D. Post** has been appointed marketing research manager of Latex Fiber Industries, Inc., Beaver Falls, N.Y., a subsidiary of United States Rubber Co., jointly operated with J. P. Lewis Co. Acting in this newly created position, Post will analyze existing markets for the company's products and study ways of increasing sales in related and non-related markets. He will work out of Boston, Mass., as well as Beaver Falls.

**L. J. Keyes** has been named vice president and director of purchases for The Dayton Rubber Co., Dayton, O. In this newly created post on the corporate staff level, Keyes will be responsible for coordinating the purchasing functions of all the company's divisions.

**Arthur L. Hall** has been transferred to the foreign operations division of Godfrey L. Cabot, Inc., Boston, Mass. Prior to this he was manager of the Cabot minerals division operations in Willsboro, N. Y. **David D. Munsell,** formerly of the new products research department, has been appointed acting manager of the Willsboro operations.

**William V. Shakespeare** is now president of Cincinnati Rubber Mfg. Co., Cincinnati, O. He succeeds **L. P. Darnell,** who has retired after four years as president. Shakespeare was assistant to the president since 1956 and vice president of the division since 1959.

**Russell W. Sloan** becomes manager of the newly created marketing planning department of Pennsalt Chemicals Corp., Philadelphia, Pa. The new department will be concerned with long-range marketing objectives. Sloan was manager of the company's commercial development department for the past four years.

**Jack Arnold, Jr.,** is now marketing coordinator for the butyl division of Enjay Co., Inc., New York, N. Y. Formerly manager of the petrochemical marketing firm's Boston office, Arnold will now be responsible for coordinating the marketing activities for Enjay Butyl rubber.

**Thomas J. Allison** has been named assistant manager, public relations department, of the Goodyear Tire & Rubber Co., Akron, O. He will be temporarily assigned to the New York office. He has been with the department since 1952.

**Ted W. Palmer** has been appointed product manager handling chelating agents for The Dow Chemical Co., Midland, Mich. He will be responsible for the sales programming of Versene chelating agents and Separan flocculants.

**John T. Lumis** is now sales manager for Wilson Petrolcoke & Carbon Corp., New York, N. Y., marketer of petroleum and carbon products. He joined the firm early in 1959 as assistant to the vice president.

**W. C. Gilbertson** is now sales manager of the foam products division of Hewitt-Robins, Inc., Stamford, Conn., and will have full responsibility for sales of all urethane and rubber foam cushioning materials. He will headquarter at Stamford. **C. A. Maher** was named assistant sales manager and will be stationed at the urethane foam plant at Franklin, N. J.

**R. Harry Borden** has been appointed district sales manager, Houston district, with headquarters at Houston, Tex., and **Stanley W. Cairns,** district sales manager for the Philadelphia district, with headquarters in New York, N. Y., for Jefferson Chemical Co., Inc., Houston. Borden was salesman in the southern region, while Cairns was formerly a salesman in the eastern area.

**R. E. Smith** will now devote full time to handling rubber reinforcing resin and rubber-to-metal bonding adhesives for Marbon Chemical Division of Borg-Warner, Washington, W. Va. His area will include New York State, Pennsylvania (except the western part), New Jersey, Delaware, Maryland, Virginia, and West Virginia.

**S. J. Spitz, Jr.,** has been named executive vice president of Newport Industries Co., a division of Heyden Newport Chemical Corp., New York, N. Y. He has been with Newport Industries since 1946. In 1959 he was appointed a vice president of the division.

**Clifford A. Coffey** will head the new automotive development group for Enjay Co., Inc., New York, N. Y. Located in Detroit, Mich., the automotive group will be responsible for the development of new uses of Enjay products (including butyl rubber, plastics, and Paramins) in the automotive industry. Coffey has been serving as acting manager of Enjay's Akron district since last December.

**Theodore L. Theodorff** has been appointed district manager of the reopened Detroit, Mich., district office of Lake Erie Machinery Corp. This office will serve Detroit and the eastern half of Michigan, as well as the western part of Ohio which includes Cleveland, Cincinnati, and Toledo. **Robert A. MacLean** becomes western district manager, with offices in Los Angeles, Calif. The company, with plant and head offices at Buffalo, N. Y., designs and manufactures heavy hydraulic presses.

**Donald C. Oskin** will fill the newly created position of vice president of executive sales of the chemical divisions, Food Machinery & Chemical Corp., New York, N. Y. He was also appointed a member of the division's executive committee. He will coordinate efforts of the five chemical divisions in serving their major accounts. Previously Oskin was vice president and assistant manager of the inorganic chemicals department.

Paul Taylor Esselburn

V. K. Hitch

Paul Taylor Esselburn

R. B. Silver

W. F. Gerrow, Jr. J. S. Brice

**William F. Gerrow, Jr.,** becomes regional sales manager, southern area, for the chemical division of International Latex Corp. He will establish sales offices in Atlanta, Ga.

**Howard H. Babcock** has been appointed manager of the news bureau for The Goodyear Tire & Rubber Co., Akron, O. He will supervise the selection, gathering, and distribution of all news about the company.

**G. J. Weis** has transferred as a technical sales representative for United Carbide Plastics Co., division of Union Carbide Corp., New York, N. Y., to a new location in the South Atlantic region. He will be stationed in Atlanta, Ga. **Robert Halvorsen** has been appointed technical sales representative in the Midwest region and will use the Dallas, Tex., office.

**Regis W. Schultis, Jr.,** has joined the new marketing planning department of Pennsalt Chemicals Corp., Philadelphia, Pa. He will work with **Robert J. Eastman,** head of special projects in the department, on studies of new markets, products, and fields. Schultis formerly was a market development representative with the company's industrial chemicals division.

**Charles F. Eckert** has been appointed manager of elastomer research at the research center of United States Rubber Co., Wayne, N. J. He succeeds **Marvin C. Brooks,** who has accepted a new assignment with the tire division, Detroit, Mich. In his new position Dr. Eckert will be responsible for directing fundamental research on new types of rubber and applied research on both existing and new types of rubber.

**R. Bruce Silver** becomes vice president and general manager of Akron Chemical Co., Akron, O. He has been with the company since 1948 and has been active in all phases of the business. **Vernon K. Hitch,** with the firm since 1935, is now vice president and sales manager of chemicals. **Harold M. Whitacre** is vice president and sales manager of compounding materials. He joined Akron Chemical in 1939.

**J. S. Brice** is now district manager of the southeastern district of Goodyear Tire & Rubber Co.'s chemical division and will headquarter at Atlanta, Ga. He was formerly senior sales representative.

**Herbert W. B. Farr** has been promoted from vice president and sales manager to executive vice president for Plastic Wire & Cable Corp., Jewett City, Conn. **James T. Daly,** formerly assistant sales manager, becomes vice president and sales manager; while **George H. Lane** moves from assistant treasurer to treasurer. **James E. Flood,** who was technical director, is now vice president and technical director. **Gordon H. Sigman,** previously purchasing agent, becomes vice president and purchasing agent. **J. Vincent McBride,** who has held the position of chief engineer, is now vice president and development director.

**William V. Stout** becomes industrial relations representative at Akron, O., for B. F. Goodrich Industrial Products Co., a division of The B. F. Goodrich Co. Prior to this appointment he was personnel manager of the company's plant at Marion, O.

**W. J. Smith** has been made manager of Firestone's new synthetic fiber plant at Hopewell, Va., according to Roger S. Firestone, president, The Firestone Synthetic Fibers Co., a division of The Firestone Tire & Rubber Co. Now in limited production, the plant is being expanded and modernized and is expected to go into full production late this summer. Smith recently held the position of manager of the plastics development laboratory at Pottstown, Pa.

**Carl A. Larson** will be branch manager of Wyrough & Loser's new sales office in New Haven, Conn., at 1388 Dixwell Ave. Mr. Larson previously was with Whitney-Blake as development engineer and rubber chemist (since 1939). The new office will serve Connecticut and eastern New York and will handle sales and technical service of the firm's Poly-Dispersions as well as products of various other companies.

Paul Taylor Esselburn

H. M. Whitacre

Jay Storm Studio

C. A. Larson

J. R. Kelly J. R. Frazier

**J. R. Kelly** has been appointed manager of the Detroit, Mich., district of the Goodyear Tire & Rubber Co.'s chemical division. **J. R. Frazier,** of the division's Akron office, succeeds him as field representative in the Cleveland, O., district.

**F. Crampton Frost** is now a member of the administrative staff of the American Standards Association, New York, N. Y. He will devote full time to membership development. **H. Warner Dailey** succeeds him as civil engineer in charge, and secretary of the Construction Standards Board and Materials & Testing Standards Board. The ASA is the clearinghouse and coordinating body for voluntary national standards. It is the United States member of the International Organization for Standardization.

**John F. Ortner** has been promoted to product manager, molding compounds, in the sales department of the Durez Plastics Division, Hooker Chemical Corp., North Tonawanda, N. Y. He formerly was assistant product manager, molding compounds.

**Louis H. Huth** will fill the newly created position of manager of operations of Amoco Chemicals Corp. and will be in charge of the company's plants at Joliet, Ill., Texas City, Tex., and Seymour, Ind. **Frank Allen Upson** has been named manager of engineering, another new position, and will be responsible for engineering and construction of new plant facilities and other major projects. Upson was chief engineer in the process engineer division of general engineering department at the Whiting refinery of Standard Oil Co. (Indiana). Huth formerly held the position of superintendent of operations in the Mandan, N. D., refinery of Standard Oil Co. (Indiana).

**Norman L. Smith** has been appointed a projects group supervisor, research department, United Carbon Co., at the Borger, Tex., research laboratory. Dr. Smith formerly was an associate professor at the University of Missouri School of Mines & Metallurgy.

**John N. Stomfay-Stitz** has been named international sales representative for Goodrich-Gulf Chemicals, Inc., Cleveland, O. He will represent the company in foreign synthetic rubber markets.

**John J. Winterbottom,** a vice president of Esso Standard, has retired after more than 43 years of service with Standard Oil Co. (N. J.) and its affiliated companies. Before his election in 1958 as a vice president and director of Esso Standard, he headed Jersey Standard's transportation coordination department, with responsibility for the company's worldwide transportation activities.

**Joseph C. Nelson, Jr.,** is the new sales manager of the calcium products division of The Georgia Marble Co., Tate, Ga. Nelson has been with the division for six years. **Robert F. Hall,** technical service director of the division, will be in charge of the quality control department while he continues in his present capacity. **Milton Gallagher,** present research director of calcium products division, will transfer to the new research and development department, with facilities now under construction.

**Clinton H. Schultz** has retired as chief chemist of The Frank G. Schenuit Rubber Co., Baltimore, Md. **Vaughn V. Wheeler,** with the company for ten years, succeeds him. **Elsworth J. Weaver,** formerly with the Firestone Tire & Rubber Co., has joined the staff as chemist for product development and production.

**Carl W. Virgin** has been appointed marketing coordinator, plastics, for Enjay Co., Inc., New York, N. Y. He will coordinate plastics sales analysis and forecasts.

**Eugene I. Owens** is now manager of manufacturer sales, and **Robert O. Willis,** manager of distributor sales, for The Firestone Rubber & Latex Products Co. Both men will make their headquarters at Fall River, Mass. Owens was eastern division sales manager. Willis previously served as sales promotion manager.

E. I. Owens R. O. Willis

Stomfay-Stitz W. S. Burriack

**William S. Burriack** becomes chemical sales representative for the Buffalo-Pittsburgh area for the Plastics & Coal Chemicals Division, Allied Chemical Corp., New York, N. Y.

**Raymond E. Christian** has been appointed sales representative in Tehran, Iran, for International B. F. Goodrich Co., a division of The B. F. Goodrich Co., Akron, O. Later this year he will become sales manager of B. F. Goodrich Iran, S.A., a tire and tube manufacturing firm recently formed by The B. F. Goodrich Co. and a group of Iranian investors, whose plant is now under construction and scheduled for operation in October.

**Robert J. Eastman** will head special projects in the new market planning department of Pennsalt Chemicals Corp., Philadelphia, Pa. The new staff unit will be concerned with the marketing aspects of new markets, products, and fields for Pennsalt. Eastman was formerly supervisor of market research for the company's commercial development department.

**George C. Brooks** has been named product supervisor, marketing department, Amoco Chemicals Corp., Chicago, Ill. **Herbert D. Holdridge, Jr.,** succeeds him as sales representative in the Chicago district. Holdridge previously held the position of administrative assistant to the general manager, marketing.

**Kenneth L. Sayre** has joined Bjorksten Research Laboratories, Madison, Wis., as senior project leader, organic and plastics division. He was previously with the laboratories from 1950 to 1953, but recently specialized in high polymer chemistry for plastic and textile applications with the B. F. Goodrich Chemical Co.

**L. Marshall Welch,** director of research, Petro-Tex Chemical Co., Houston, Tex., has been appointed a vice president of the company. With the company since 1956, Dr. Welch will continue to direct research planning and activities at the Houston, Tex., and Princeton, N. J., laboratories.

*(Continued on page 886)*

# MARKET REVIEWS

## Natural Rubber

During the January 16-February 15 period both in New York and London physical rubber was neglected. Consumers showed hardly any interest in the fairly substantial, but too-high priced offers from the Far East. The exchanges have been the centers of activity, but in the absence of any decisive market trend, operators have been showing extreme caution, and dealings most of the time have been fairly light. The moderate gain in values registered during the last week of January was later pared on profit taking. The ensuing decline in New York reflected the easiness of Wall Street activity.

The January Rex contracts in New York were liquidated without difficulty, according to one source. There has been no attempt to keep the nearer months at an abnormal premium. There were rumors that substantial quantities of RSS #1 were shipped on consignment from Malaya to New York at the end of January. Whether or not this rubber has since been sold by the original consignor, it may help to meet sales on the terminal markets.

First shipment of crude rubber direct from the Far East to the Great Lakes is scheduled to arrive in Cleveland, O., in May aboard the steamer *Pinar*. The trial shipment was arranged by five major rubber companies. Cleveland will receive 1,300 tons of the 3,300-ton shipment. The remainder will be unloaded at Detroit, Chicago, Toronto and Hamilton, Ont., Canada. Last year some 550,000 long tons of rubber were imported by the United States; thus the outcome of this trial shipment in inland ports could be of considerable business importance.

It was reported from Peiping that Ceylon will ship 17,000 metric tons of natural rubber to Red China in exchange for 160,000 metric tons of rice under the terms of the newly signed 1960 trade agreement. The approximate value of the bartered commodities is $13,440,000. Under the pact Red China has options to obtain another 5,000 tons of rubber from Ceylon in exchange for goods other than rice, and to buy further stocks up to the value of $13,400,000 with acceptable currency.

January sales, on the New York Commodity Exchange, amounted to 13,140 tons, compared with 11,460 tons for December contract. There were 20 trading days in January, and 20 during the January 16-February 15 period.

On the physical market, RSS #1, according to the Rubber Trade Association of New York, averaged 40.01¢ per pound for the January 16-February 15 period. Average January sellers' prices for representative grades were: RSS #3, 40.85¢; #3 Amber Blankets, 41.02¢; and Flat Bark, 36.89¢.

REX CONTRACT

| 1960 | Jan. 22 | Jan. 29 | Feb. 5 | Feb. 12 |
|---|---|---|---|---|
| Jan. | 39.90 | | | |
| Mar. | 39.96 | 40.05 | 38.85 | 38.66 |
| May | 39.10 | 39.35 | 38.10 | 38.26 |
| July | 38.25 | 38.65 | 37.60 | 37.60 |
| Sept. | 37.65 | 38.15 | 37.05 | 37.15 |
| Nov. | 37.15 | 37.20 | 36.50 | 36.70 |
| 1961 | | | | |
| Jan. | 36.65 | 36.50 | 35.90 | 36.30 |
| Mar. | .... | 36.00 | 35.60 | 35.90 |

NEW YORK OUTSIDE MARKET

| | Jan. 22 | Jan. 29 | Feb. 5 | Feb. 12 |
|---|---|---|---|---|
| RSS #1 | 40.25 | 40.25 | 38.88 | 39.13 |
| #2 | 40.13 | 40.13 | 38.75 | 39.00 |
| #3 | 40.00 | 40.00 | 38.63 | 38.88 |
| Pale Crepe #1 Thick | 46.00 | 46.25 | 44.25 | 44.88 |
| Thin | 45.75 | 46.00 | 44.75 | 45.38 |
| #3 Amber Blankets | 40.25 | 40.25 | 39.13 | 39.50 |
| Thin Brown Crepe | 40.00 | 40.00 | 38.63 | 39.25 |
| Standard Flat Bark | 36.50 | 36.50 | 36.00 | 36.38 |

## Synthetic Rubber

Consumption of total new rubber in the United States for January amounted to 142,538 long tons, increasing 7.98% over the December figure of 132,002 long tons. A new monthly high for production of synthetic rubber was established with 130,684 long tons for January, compared with the previous peak of 128,532 long tons recorded in October, 1959, according to the monthly report of The Rubber Manufacturers Association, Inc.

Consumption of all types of synthetic rubber in January amounted to 95,767 long tons, contrasted with December's consumption of 89,052 long tons. Synthetic rubber accounted for 67.19% of total new rubber, against 67.46% for December.

Consumption by type in January, compared with December usage, in long tons, increased for all types as follows: SBR, 79,660, against 73,871; neoprene, 7,225, against 6,996; butyl, 6,124, against 5,489; and nitrile, 2,758, against 2,696.

Total synthetic exports for January dropped to 24,290 long tons from 32,350 long tons in December; while total synthetic stocks increased to 222,161 long tons from 210,846 long tons in December.

Trends in SBR masterbatches showed the oil-black masterbatch production up to 23,971 long tons in January from 21,438 tons in December. Carbon black masterbatches in contrast dropped to 2,954 tons in January from 4,479 tons produced in December. The oil-extended rubber production showed a slight increase in January to 27,350 tons from 26,764 long tons in December.

## Latex

A moderate amount of interest continued to be shown in drum latex during the January 16-February 15 period. With supplies still rather limited, the recent slight hardening of the differential has been consolidated.

The bulk latex market has in the main been very quiet, although it was reported that a few inquiries have resulted in commitments being entered into for distant shipment.

Malayan production of latex during 1959 totaled 125,072 tons, compared with 117,660 tons in 1958. Shipments during 1959 reached 128,650 tons, against 114,772 tons in the previous year. Details of shipments according to destinations showed the United States and the United Kingdom neck and neck, with 32,256 tons and 32,854 tons, respectively. Japan showed a significant increase with 16,477 tons taken in 1959, against the 9,930 tons she imported during 1958.

Prices for ASTM centrifuged concentrated natural latex, in tank-car quantities, f.o.b., rail tank car, ran about 45.50¢ per pound solids. Synthetic latices prices were 26.0 to 40.25¢ for SBR; 37 to 57¢ for neoprene; and 45 to 60¢ per pound for the nitrile types.

(All figures in long tons, dry weight)

| Type of Latex | Production | Imports | Consumption | Month-End Stocks |
|---|---|---|---|---|
| Natural | | | | |
| Nov. | 0 | 5,055 | 4,858 | 11,707 |
| Dec. | 0 | * | 5,206 | 12,377 |
| SBR | | | | |
| Nov. | 8,144 | — | 6,427 | 8,279 |
| Dec. | 8,429 | — | 7,428 | 8,226 |
| Neoprene | | | | |
| Nov. | 1,206 | 0 | 893 | 1,464 |
| Dec. | 1,017 | 0 | 895 | 1,451 |
| Nitrile | | | | |
| Nov. | 1,104 | 0 | 981 | 2,975 |
| Dec. | 1,045 | 0 | 993 | 2,883 |

* Not available yet for period covered.

# Market Reviews

## Reclaimed Rubber

Domestic and Canadian sales of reclaimed rubber which continued good during the January 16-February 15 period, according to one source, were expected to lessen somewhat during the following 30 days as a result of the reduction in automobile production in effect on both sides of the border. On the other hand, overseas demand for American-made reclaims has been increasing, and should continue to increase, owing to what appears to be a severe shortage of reclaimed rubber production in the United Kingdom and on the Continent.

Another reclaimer, in the Midwest, reported that business picked up some during this period under review, but not so much as had been hoped for following the steel strike settlement. In effect, business continues good, but not quite up to expectations.

A reclaimer in the East reported also that the market was slightly lower than originally anticipated. Shipments for this period were 4% lower than during the similar period in 1959.

An error appeared in the January, 1960, issue in this column regarding the statement, "Another reclaimer reported that owing to the announcement of a recent price increase of 14¢ per pound on butyl reclaim as well as black natural rubber inner-tube reclaim, substantial shipments in these types were made in November." The price increase in both cases was not 14¢ but actually 1¢ per pound.

According to The Rubber Manufacturers Association, Inc., report, January production of reclaimed rubber was 26,175 long tons; while consumption was 25,717 long tons. December figures had been: production, 23,720 long tons; consumption, 22,962 long tons.

RECLAIMED RUBBER PRICES

| | |
|---|---|
| Whole tire, first line | $0.11 |
| Third line | .1025 |
| Inner tube, black | .17 |
| Red | .21 |
| Butyl | .15 |
| Light carcass | .22 |
| Mechanical, light-colored, medium gravity | .155 |
| Black, medium gravity | .085 |

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims, in each general group separately featuring characteristic properties of quality, workability, and specific gravity, at special prices.

## Scrap Rubber

During the January 16-February 15 period fairly good activity characterized the scrap rubber market. Toward the close of this period scrap was moving regularly to consumers, with the most of the buying interest apparently centered on tubes. Mixed auto tubes showed more strength, at 5.00 to 5.50¢, both at eastern and midwestern points. Butyl tubes also were stronger at 7.00¢ in both the East and the Midwest. Mixed auto tires continued at $7.00 to $12.50 in the East, with the high side of this range applicable only on shipments to Buffalo. Tires were firmer at Akron, at $12.50.

A tentative calendar of events for the forty-seventh annual convention of the National Association of Waste Material Dealers, March 12-15, at the Waldorf-Astoria Hotel, New York, N. Y., has been announced. The convention opens March 12 with a luncheon-meeting of the NAWMD board of directors and concludes on March 15 with the annual luncheon-meeting for all members, at which time elections for 1960-1961 will be held. Monday's schedule highlights a session of the Scrap Rubber & Plastics Institute.

| | Eastern Points | Akron, O. |
|---|---|---|
| | Per Net Ton | |
| Mixed auto tires | $7.00 | $12.50 |
| S.A.G. truck tires | nom. | 17.00 |
| Peeling, No. 1 | nom. | 26.00 |
| 2 | nom. | 22.00 |
| 3 | nom. | 19.00 |
| Tire buffings | nom. | nom. |
| | (¢ per Lb.) | |
| Auto tubes, mixed | 5.00 | 5.50 |
| Black | 5.75 | 5.75 |
| Red | 6.25 | 6.25 |
| Butyl | 7.00 | 7.00 |

## Rayon and Nylon

Production of tire cord and tire fabric during the fourth quarter of 1959 was 111,703 thousand pounds. This amount was 7% below that of the previous quarter and equal to the fourth-quarter, 1958, level.

The output of rayon tire cord and tire cord fabric decreased 13% from the previous quarter's level to 66,756 thousand pounds. During the same period the production of nylon tire cord and tire cord fabric, according to the Bureau of the Census, increased 9% to 33,239 thousand pounds; while the production of cotton tire cord and tire cord fabric (excluding chafer fabrics) increased to 940 thousand pounds.

Stocks of tire cord and tire cord fabric on January 2, 1960 were 52,403 thousand pounds, or 7% above the October 3, 1959, level and 34% more than the stocks on January 3, 1959.

Totaled packaged production of rayon and acetate filament yarn during 1959 was 737.7 million pounds, consisting of 332.2 million pounds of high-tenacity rayon yarn and 405.5 million pounds of regular-tenacity filament yarn. Totaled packaged production for December had been: total, 63.4 million pounds; high-tenacity, 26.6 million pounds, and regular-tenacity, 36.8 million pounds.

Filament yarn shipments for 1959 to domestic consumers totaled 720.4 million pounds, of which 322.5 million pounds were high-tenacity rayon yarn, and 397.9 million pounds were regular-tenacity rayon yarn. Shipments for December had been: total, 55.9 million pounds; high-tenacity, 23.2 million pounds; regular-tenacity, 32.7 million pounds.

End-of-year stocks for 1959 for rayon and acetate filament yarn were: total, 56.3 million pounds; high-tenacity, 15.2 million pounds; and regular-tenacity, 41.1 million pounds.

RAYON PRICES

Tire Fabrics

| | |
|---|---|
| 1100/490/2 | $0.625/$0.78 |
| 1650/908/2 | .685 |
| 2200/980/2 | .655 |

Tire Yarns

| | |
|---|---|
| High-Tenacity | |
| 1100/ 490, 980 | .57/ .66 |
| 1100/ 490 | .57/ .66 |
| 1150/ 490, 980 | .59/ .63 |
| 1165/ 480 | .59/ .66 |
| 1230/ 490 | .59/ .63 |
| 1650/ 720 | .50/ .60 |
| 1650/ 980 | .50/ .58 |
| 1875/ 980 | .55/ .58 |
| 2200/ 960 | .49/ .57 |
| 2200/ 980 | .49/ .57 |
| 2200/1466 | .49/ .64 |
| 4400/2934 | .60 |
| Super-High Tenacity | |
| 1650/ 720 | .50/ .60 |
| 1900/ 720 | .58 |

NYLON PRICES

Tire Yarns

| | |
|---|---|
| 840/140 | .97 |
| 1680/280 | .97 |

## Industrial Fabrics

Producers of industrial grey cotton goods, during the first week of February, received requests for earlier than initially scheduled deliveries of wide sheetings, drills, broken twills, osnaburgs, and other standard constructions. Increased contract backlogs continued to induce greater yardages on looms weaving 60-inch and wider widths. Among these looms are those planned to run into and beyond the April-June quarter, according to trade sources.

Coaters serving the automobile industry chiefly have been reducing their on-hand and on-contract yardages. Reports from many in this quarter expect these coaters to reach the point by late March and early April of exhausting inventories. Then, the prospect is that a flurry of new orders will develop, and mills' books again serve to meet the needs of coaters looking ahead to July on finished fabric requirements.

Ordinarily June brings on the period when the old year for automobile production lags. But the time lost this year and last is counted on carrying automobile production into June and July. This action will tend to prolong need of additional grey cotton goods,

(*Continued on page 885*)

# Synthetic Rubbers and Latices*

### Monomers

| | | |
|---|---|---|
| 11-80, 100, 200, 112-3 Triols | lb. | $0.255 |
| 11-300 | lb. | .265 |
| -400 | lb. | .325 |
| Acrylonitrile | lb. | .27 |
| Butadiene | lb. | .15 |
| Dow Styrene | lb. | .12 |
| H99, N99 | lb. | .205 |
| RG | lb. | .17 |
| Vinyltoluene | lb. | .17 |
| EGD | lb. | 1.75 / $2.00 |
| Hylene M | lb. | 1.25 / 2.75 |
| M-50 | lb. | .86 / 2.36 |
| T | lb. | .90 / 2.46 |
| TM | lb. | .75 / 2.31 |
| -65 | lb. | .80 / 2.36 |
| Isobutylene | gal. | .38 |
| Isoprene | lb. | .25 |
| Mondur-C | lb. | 1.05 |
| Multron R-2 | lb. | .54 |
| P200 | lb. | .23 |
| Rohm & Haas ethyl acrylate | lb. | .34 / .36 |
| Glacial methacrylic acid | lb. | .40 / .425 |
| Methyl acrylate | lb. | .37 / .39 |
| Methacrylate | lb. | .29 / .31 |

### Shortstops

| | | |
|---|---|---|
| 4P Mercaptan | lb. | .27 / .31 |
| DDM | lb. | .94 / .975 |
| Mercaptan 174 | lb. | .38 / .50 |
| Sharstop 204 | lb. | .38 / .42 |
| 268 | lb. | .52 / .53 |
| Tecquinol | lb. | .825 / .845 |
| Thiostop K | lb. | .50 / .53 |
| N | lb. | .38 / .47 |
| Vulnapol KM | lb. | .52 / .56 |
| NM | lb. | .38 / .42 |
| Wingstop B | lb. | .38 |

### Acrylic Types

| | | |
|---|---|---|
| Acrylon BA-15 | lb. | 1.25[a] |
| EA-5 | lb. | 1.00[a] |
| Hycar 4021 | 1.34[a] / | 1.35[a] |

#### Latices

| | | |
|---|---|---|
| Hycar 2600X30, 2600X39, 2601 | lb. | .50 / .56 |

### Butadiene Types (BR†)

| | | |
|---|---|---|
| Cis-1 | lb. | .35[b] / .50[b] |

#### Cold BR Latex

| | |
|---|---|
| Pliolite Latex 2104 | .325 |

### Fluorocarbon Types

| | | |
|---|---|---|
| Kel-F Elastomer | lb. | 15.00 / 16.00 |
| 5500, 820 (Latex) | lb. | 15.00 / 17.15 |
| Viton A, AHV | lb. | 10.00 |
| B | lb. | 13.00 |

### Isobutylene Types

| | | |
|---|---|---|
| Enjay Butyl 035, 065, 150, 215, 217, 218, 325 | | .23[a] |
| 165, 268, 365 | | .24[a] |
| Hycar 2202 | .65[a] / | .75[a] |
| Polysar Butyl 100, 200, 300 400 | | .245[a] |
| 101 | | .2775[a] |
| 301 | | .255[a] |
| Vistanex LM | | .45[a] |
| MM | | .35[a] |

### Neoprene Types (CR)

| | | |
|---|---|---|
| Neoprene Type AC, AD, CG | .55[a] / | .575[a] |
| FB | .65[a] / | .675[a] |
| GN, GN-A, WX | .41[a] / | .435[a] |
| GRT, S | .42[a] / | .445[a] |
| KNR | .75[a] / | .775[a] |
| W, WHV | .39[a] / | .415[a] |
| WRT | .45[a] / | .475[a] |

#### Latices

| | | |
|---|---|---|
| Neoprene Latex 571, 842-A | .37[a] / | .47[a] |
| 572 | .39[a] / | .49[a] |
| 60, 601-A | .40[a] / | .50[a] |
| 635 | .41[a] / | .51[a] |
| 650 | .42[a] / | .52[a] |
| 735, 736 | .38[a] / | .48[a] |
| 750 | .39[a] / | .49[a] |
| 950 | .47[a] / | .57[a] |

### Nitrile Types

| | |
|---|---|
| Butaprene NF | .49[b] |
| NH | .65[b] |
| NL | .50[b] |
| NXM | .58[b] |
| Chemigum, N1NS | .64[b] |
| N3NS, N5 | .58[b] |
| N6, N-6B, N7, N8 | .50[b] |
| N600 | .50[b] |

| | | |
|---|---|---|
| Hycar 1001, 1041 | $0.58[a] | / $0.59[a] |
| 1002, 1042, 1043, 1052, 1053, 1312 | .50[a] | / .51[a] |
| 1014 | .60[a] | / .61[a] |
| 1072 | .64[a] | / .65[a] |
| 1411 | .62[a] | / .63[a] |
| 1432, 1441 | .59[a] | / .60[a] |
| Paracril, AJ | .485[c] | / .495[c] |
| B, BJ, BJLT, BLT | .50[c] | / .51[c] |
| C, CLT | .58[c] | / .59[c] |
| CV | .59[c] | / .60[c] |
| D | .65[c] | / .66[c] |
| OZO | .46[c] | / .47[c] |
| 18-80 | .60[c] | / .61[c] |
| Polysar Krynac 800, 802, 803 | | .50[a] |
| 801 | | .58[a] |

#### Latices

| | |
|---|---|
| Butaprene N-300 | .46[b] |
| N-400, N-401 | .54[b] |
| Chemigum 200 | .49[b] |
| 235 CHS, 236 | .54[b] |
| 245 B, 245 CHS, 246, 247, 248 | .46[b] |
| Hycar 1512, 1552, 1562, 1577 | .45[a] / .52[a] |
| 1551, 1561, 1571 | .53[a] / .60[a] |
| 1852 | .46[a] / .52[a] |
| Nitrex 2612 | .45[a] / .52[a] |
| 2616 | .53[a] / .60[a] |
| 2619 | .52[a] / .59[a] |
| 2620, 2625 | .45[a] / .52[a] |
| Tylac 640 | .45[a] / .52[a] |
| 740 | .49[a] / .56[a] |
| 840 | .53[a] / .60[a] |
| 1640 | .54[a] / .61[a] |

### Polyethylene Type

| | | |
|---|---|---|
| Hypalon 20 | lb. | .47 |
| 30 | lb. | .60 |
| 40 | lb. | .50 |

### Polysulfide Types

| | |
|---|---|
| Thiokol LP-2, -3, -31, -32, -33 | .96[a] |
| -8 | 1.35[a] |
| -205 | 4.00[a] |
| Type-A | .50[a] |
| FA | .69[a] |
| ST | 1.25[a] |

#### Latices

| | |
|---|---|
| Thiokol Latex (dry wt.) Type MX | .80[a] |
| WD-2 | 1.25[a] |
| -6 | .80[a] / 1.25[a] |

### Silicone Types

| | | |
|---|---|---|
| GE (compounded) | 2.29[a] / | 4.90[a] |
| Silicone gum | 3.85[a] / | 4.55[a] |
| Silastic (compounded) | 2.95[b] / | 3.50[b] |
| (Partly compounded) | 3.15[b] / | 3.60[b] |
| (Uncompounded) | 4.05[b] / | 4.35[b] |
| LS-53 | 12.00 / | 16.30 |
| Union Carbide (compounds) | 2.35[b] / | 3.20[b] |
| (Gums) | 3.85[b] / | 4.25[b] |

### Styrene Types

#### Hot SBR‡

| | | |
|---|---|---|
| Ameripol 1000, 1001, 1006, 1007 | .24[a] / | .247[a] |
| 1002 | .2435[a]/ | .2495[a] |
| 1006 Crumb | .2475[a]/ | .2535[a] |
| 1009 | .2475[a]/ | .2535[a] |
| Crumb | .259[a] / | .265[a] |
| 1011 | .2475[a]/ | .2535[a] |
| 1012 | .2425[a]/ | .2485[a] |
| Crumb | .249[a] / | .255[a] |
| 1013 | .241[a] / | .247[a] |
| Crumb | .2615[a]/ | .2675[a] |
| ASRC 1004, 1006 | .241[a] / | .2475[a] |
| 1009 | .2475[a]/ | .2535[a] |
| 1018 | .27[a] / | .276[a] |
| 1019 | .265[a] / | .271[a] |
| Copo 1006 | .241[a] / | .247[a] |
| FR-S 1000, 1001, 1004, 1006 | .241[a] / | .247[a] |
| 1007 | .241[a] / | .247[a] |
| 1009 | .2475[a]/ | .2535[a] |
| 1010 | .26[a] / | .266[a] |
| 1012 | .2425[a]/ | .2485[a] |
| 1013 | .241[a] / | .247[a] |
| Crumb | .2615[a]/ | .2675[a] |
| 1014 | .281[a] / | .287[a] |
| 141 | .28[a] / | .286[a] |
| 181 | .241[a] / | .247[a] |
| Naugapol 1016, 1019 | .265[b] / | .27[b] |
| 1018 | .27[b] / | .275[b] |
| 1021 | .30[b] / | .305[b] |
| 1022 | .295[b] / | .30[b] |
| 1023 | .315[b] / | .32[b] |
| 6003 | .27[b] / | .275[b] |
| Philprene 1000, 1001, 1006, 6701 | .241[b] / | .247[b] |
| 1009 | .2475[b]/ | .2535[b] |
| 1018 | .27[b] / | .276[b] |
| 1019 | .265[b] / | .271[b] |
| Plioflex 1006 | .241[a] / | .247[a] |
| Polysar S-630 | .241[a] / | .247[a] |
| S-X-371 | .255[a] / | .261[a] |
| S-1000, -1006, -1013 | | .23[a] |
| -1002, -1011 | | .2325[a] |
| -1009 | | .24[a] |
| Synpol 1000, 1001, 1006, 1007, 1061 | .241[b] / | .247[bb] |
| 1002 | .2435[b]/ | .2495[b] |
| 1012 | .2425[b]/ | .2485[b] |
| 1009 | .2475[b]/ | .2535 |
| 8000 | .241[b] / | .247[b] |
| X-274 | .255[a] / | .261[a] |

#### Hot SBR Black Masterbatch

| | |
|---|---|
| Philprene 1100 | $0.194 |
| 1104 | .190[a] |
| S-1100 | .185[a] |

#### Hot SBR Latices

| | | |
|---|---|---|
| FR-S 2000, 2001 | $0.2725[a]/ | .3425[a] |
| 2002 | .35[a] / | .36[a] |
| 2003, 2004 | .305[a] / | .36[a] |
| 2006 | .29[a] / | .382[a] |
| Naugatex 2000, 2001 | .2775[a]/ | .3575[a] |
| 2002 | .30[a] / | .37[a] |
| 2006 | .29[a] / | .42[a] |
| Pliolite Latex 2000, 2001 | | .2825 |
| 2076 | | .295[a] |
| Polysar Latex II | | .29[a] |
| IV | | .2775 |
| S-2000, 2006 | | .26[a] |

#### Cold SBR

| | | |
|---|---|---|
| Ameripol 1500, 1501, 1502, 4600 | .241[a] / | .247[a] |
| ASRC 1500, 1502 | .241[a] / | .247[a] |
| 1503 | .2625[a]/ | .2685[a] |
| 3105, 3106 | .241[a] / | .247[a] |
| 3110 | .26[a] / | .266[a] |
| C-102 | | .23[a] |
| Copo 1500, 1502 | .241[a] / | .247[a] |
| 1505 | .261[a] / | .267[a] |
| FR-S 1500, 1502, 146, 179 | .241[a] / | .247[a] |
| 127 | .26[a] / | .266[a] |
| Gentro 1500 | | .241 |
| Naugapol 1503 | .2625[b]/ | .2675[b] |
| 1504 | .33[b] / | .335[b] |
| 6100 | .31[b] / | .315[b] |
| Philprene 1500, 1502 | .241[b] / | .247[b] |
| 1503 | .2625[b]/ | .2685[b] |
| Plioflex 1500C, 1502, 1507, 1508X | .241[a] / | .247[a] |
| Polysar Kryflex 200 | | .251[a] |
| 252 | | .27[a] |
| Krylene NS | | .241[a] |
| SS-250, SS-250-Flake | | .2875[a] |
| S-1500, S-1502 | | .23[a] |
| 1509 | | .23[a] |
| Synpol 1500, 1502, 1551 | .241[b] / | .247[b] |

#### Cold SBR Black Masterbatch

| | | |
|---|---|---|
| Ameripol 4650 | .182[a] / | .188[a] |
| 4651 | .177[a] / | .183[a] |
| 4652 | .1425[a]/ | .1485[a] |
| 4654 | .187[a] / | .193[a] |
| 4655 | .182[a] / | .188[a] |
| Baytown 1600, 1601, 1602 | | .193[b] |
| CB-102 | | .185[a] |
| Gentro-Jet 9152 | | .208 |
| 9153 | | .182 |
| 9154 | | .1845 |
| Philprene 1601 | .193[b] / | .199[b] |
| 1603 | .196[b] / | .202[b] |
| 1605 | .19[b] / | .196[b] |
| S-1600, -1602 | | .1825[a] |
| -1605 | | .18[a] |
| Synpol 8150 | .193[b] / | .199[b] |
| 8151 | .182[b] / | .186[b] |

#### Cold SBR Oil Masterbatch

| | | |
|---|---|---|
| Ameripol 1705 | .2035[a]/ | .2095[a] |
| 1707, 1708 | .191[a] / | .197[a] |
| 1710, 1712 | .1885[a]/ | .1945[a] |
| 4700 | .175[a] / | .181[a] |
| 4701 | .1725[a]/ | .1785[a] |
| ASCR 1703 | .206[a] / | .212[a] |
| 1708 | .191[a] / | .197[a] |
| 1712 | .1885[a]/ | .1945[a] |
| 1713 | .175[a] / | .181[a] |
| Carbomix 3750 | .182[a] / | .188[a] |
| 3752 | .1845[a]/ | .1905[a] |
| 3754 | .177[a] / | .183[a] |
| Copo 1712 | .1885[a]/ | .1945[a] |
| 1773 | .206[a] / | .212[a] |
| 1778 | .191[a] / | .197[a] |
| 3900 | .231[a] / | .237[a] |
| FR-S 1703 | .206[a] / | .212[a] |
| 1710 | .1885[a]/ | .1945[a] |
| 1712 | .1885[a]/ | .1945[a] |
| 123 | .196[a] / | .202[a] |
| 154, 155 | .1885[a]/ | .1945[a] |
| 173 | .206[a] / | .212[a] |
| 178 | .191[a] / | .197[a] |
| Gentro 1712 | | .1885 |
| Philprene 1703 | .206[b] / | .212[b] |
| 1708 | .191[b] / | .197[b] |
| 1712 | .1885[b]/ | .1945[b] |
| Plioflex 1703, 1773 | .206[a] / | .212[a] |
| 1710C, 1712C | .1885[a]/ | .1945[a] |
| 1713 | .175[a] / | .181[a] |
| 1714C | .1725[a]/ | .1785[a] |
| 1773 | .206[a] / | .212[a] |
| 1778 | .191[a] / | .197[a] |
| Polysar Krynol 651 | | .1885[a] |
| 652 | | .191[a] |
| S-1703 | | .195[a] |
| -1707 | | .18[a] |
| -1709, -1712 | | .1775[a] |
| -7701 | | .185[a] |
| Synpol 1703 | .206[b] / | .212[b] |
| 1707, 1708 | .191[b] / | .197[b] |
| 1711 | .19[b] / | .196[b] |
| 1712 | .1885[b]/ | .1945[b] |
| 8200 | .191[b] / | .197[b] |
| 8201 | .175[b] / | .181[b] |
| 8202 | .1725[b] / | .1785[b] |

*(Continued on page 884)*

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[a] Freight extra.
[b] Minimum freight allowed.
[c] Freight prepaid.
* Prices are per pound carload of tank-car dry weight unless otherwise specified.
† BR—Butadiene rubber.
‡ SBR—Styrene-butadiene rubber.

# Compounding Ingredients*

## Abrasives

| | | | |
|---|---|---|---|
| Pumicestone, powdered | lb. | $0.0363/ | $0.065 |
| Rottenstone, domestic | lb. | .03 / | .04 |
| Shelblast | ton | 80.00 / | 165.00 |
| Walnut Shell Grits | ton | 50.00 / | 160.00 |

## Accelerators

| | | | |
|---|---|---|---|
| A-1 (Thiocarbanilide) | ton | .74 / | .81 |
| A-32 | ton | .66 / | .80 |
| A-100 | lb. | .52 / | .66 |
| Accelerator B | lb. | .92 | |
| 49 | lb. | .59 / | .60 |
| 52 | lb. | 1.14 | |
| 57, 62, 67, 77 | lb. | 1.04 | |
| 66 | lb. | 4.25 | |
| 89 | lb. | 1.20 | |
| 108 | lb. | .92 | |
| 552 | lb. | 2.25 | |
| 808 | lb. | .66 / | .68 |
| 833 | lb. | 1.17 / | 1.19 |
| Altax | lb. | .54 / | .56 |
| Amax | lb. | .75 / | .77 |
| No. 1 | lb. | .71 / | .73 |
| Arazate | lb. | 2.25 | |
| Beutene | lb. | .66 / | .68 |
| Bismate | lb. | 3.00 | |
| B-J-F | lb. | .27 / | .32 |
| Butazate | lb. | 1.04 | |
| Butyl Eight | lb. | 1.10 / | 1.35 |
| Namate | lb. | .45 / | .50 |
| Zimate | lb. | 1.04 | |
| Ziram | lb. | .89 / | 1.04 |
| Captax | lb. | .44 / | .46 |
| Conac S | lb. | .76 / | .78 |
| C-P-B | lb. | 1.95 | |
| Cumate | lb. | 1.45 | |
| Cydac | lb. | .71 / | .73 |
| Cyuram DS, powder | lb. | 1.14 | |
| Pellets | lb. | 1.14 | |
| MS, powder | lb. | 1.14 | |
| Pellets | lb. | 1.14 | |
| Cyzate B, E | lb. | .87 / | .89 |
| Delac-S | lb. | .71 / | .73 |
| DIBS | lb. | .85 / | .87 |
| Dipac | lb. | .85 | |
| DOTG (diorthotolylguanidine) | | | |
| Cyanamid | lb. | .69 / | .70 |
| Du Pont | lb. | .69 / | .70 |
| DPG (diphenylguanidine) | | | |
| Cyanamid | lb. | .49 / | .50 |
| Monsanto | lb. | .49 / | .50 |
| El-Sixty | lb. | .62 / | .64 |
| Ethazate | lb. | 1.04 | |
| 50-D | lb. | .87 / | .89 |
| Ethyl Seleram | lb. | 3.00 | |
| Thiurad | lb. | 1.04 | |
| Thiuram | lb. | 1.04 | |
| Tuads | lb. | 1.04 | |
| Tuex | lb. | 1.04 | |
| Zimate | lb. | 1.04 | |
| Ziram | lb. | .89 / | 1.04 |
| Ethylac #650 | lb. | .93 / | .95 |
| Guantal | lb. | .62 / | .64 |
| Hepteen Base | lb. | 1.85 | |
| Ledate | lb. | 1.04 | |
| MBT (2-mercaptobenzothiazole) | | | |
| American Cyanamid | lb. | .44 / | .46 |
| Du Pont | lb. | .44 / | .46 |
| Naugatuck | lb. | .44 / | .49 |
| -XXX, Cyanamid | lb. | .55 / | .57 |
| MBTS (mercaptobenzothiazyl disulfide) | | | |
| Cyanamid | lb. | .54 / | .56 |
| Du Pont | lb. | .54 / | .56 |
| Naugatuck | lb. | .54 / | .56 |
| -W Cyanamid | lb. | .59 / | .61 |
| Merac #225 | lb. | .75 / | 1.05 |
| Mertax | lb. | .55 / | .57 |
| Methazate | lb. | 1.04 | |
| Methyl Thiuram | lb. | 1.14 | |
| Tuads | lb. | 1.14 | |
| Zimate | lb. | 1.04 | |
| Monex | lb. | 1.14 | |
| Mono-Thiurad | lb. | 1.14 | |
| 2-MT (2-mercaptothiazoline) | | | |
| Cyanamid | lb. | .88 / | .90 |
| Du Pont | lb. | 1.00 | |
| NA-22 | lb. | 1.05 | |
| NOBS No. 1 | lb. | .71 / | .73 |
| Special | lb. | .75 / | .77 |
| O-X-A-F | lb. | .55 / | .57 |
| Pennac SDB | lb. | .45 / | .48 |
| Pentex | lb. | 1.24 | |
| Flour | lb. | .30 | |
| Permalux | lb. | 2.25 | |
| Phenex | lb. | .52 / | .59 |
| Pip-Pip | | 2.07 | |
| Polyac Pellets | lb. | 1.85 | |
| R-2 Crystals | lb. | 4.35 | |
| Rotax | lb. | .55 / | .57 |
| RZ-50, -50B | lb. | 1.00 | |
| S.A. 52 | lb. | 1.14 | |
| 57, 62, 67, 77 | lb. | 1.04 | |
| 66 | lb. | 3.00 | |
| Santocure | lb. | .71 / | .73 |
| NS | lb. | .71 / | .73 |
| Selenacs | lb. | 3.00 | |
| SPDX-GH | lb. | .69 / | .74 |
| GL | lb. | 1.20 / | 1.34 |
| Sulfads | lb. | 1.98 | |
| Tellurac | lb. | 1.30 / | 1.55 |
| Tepidone | lb. | $0.45 | |
| Tetrone A | lb. | 1.98 | |
| Thiates | lb. | .88 / | $1.25 |
| Thiofide | lb. | .54 / | .56 |
| Thionex | lb. | 1.14 | |
| Thiotax | lb. | .44 / | .46 |
| Thiurad | lb. | 1.14 | |
| Thiuram E | lb. | 1.04 | |
| M | lb. | 1.14 | |
| Trimene | lb. | .56 / | .58 |
| Base | lb. | 1.03 / | 1.06 |
| Tuex | lb. | 1.14 | |
| Ultex | lb. | 1.00 / | 1.10 |
| Unads | lb. | 1.14 | |
| Ureka Base | lb. | .66 / | .73 |
| Vulcacure NB | lb. | .45 | |
| NS | lb. | .75 / | 1.05 |
| T.M.D. | lb. | 1.14 | |
| ZB, ZE, ZM | lb. | .85 / | .89 |
| Z-B-X | lb. | 2.45 | |
| Zenite | lb. | .54 / | .56 |
| A | lb. | .69 / | .71 |
| AM | lb. | .76 / | .78 |
| Special | lb. | .55 / | .57 |
| Zetax | lb. | .55 / | .57 |
| Zimate | lb. | 1.04 | |
| ZMBT | lb. | .55 / | .57 |

## Accelerator-Activators, Inorganic

| | | | |
|---|---|---|---|
| Lime, hydrated | ton | 21.96 | |
| Litharge, comml. | lb. | .1425/ | .1575 |
| Eagle, sublimed | lb. | .1535 | |
| National Lead, sublimed | lb. | .1585 | |
| Red lead, comml. | lb. | .185 / | .195 |
| Eagle | lb. | .1575 | |
| National Lead | lb. | .1625/ | .1645 |
| PRD-90 | lb. | .38 / | .50 |
| White lead, carbonate | lb. | .19 / | .20 |
| Eagle | lb. | .17 / | .18 |
| National Lead | lb. | .18 / | .19 |
| Silicate | lb. | .1725/ | .1825 |
| Eagle | lb. | .1475/ | .22 |
| National Lead | lb. | .165 / | .175 |
| Zinc oxide, comml.† | lb. | .145 / | .155 |

## Accelerator-Activators, Organic

| | | | |
|---|---|---|---|
| Aktone | lb. | .2125/ | .2325 |
| Barak | lb. | .65 | |
| Capital 170 | lb. | .20 / | .25 |
| 171 | lb. | .1425/ | .1925 |
| 225, 258, 710 | lb. | .14 / | .19 |
| 261 | lb. | .155 / | .18 |
| 262 | lb. | .16 / | .185 |
| 263 | lb. | .1775/ | .2025 |
| 270 | lb. | .1175/ | .1425 |
| Curade | lb. | .57 / | .59 |
| D-B-A | lb. | 1.95 | |
| Emery 600 | lb. | .1425/ | .1925 |
| G-M-F | lb. | 2.60 / | 2.65 |
| PDD-70 | lb. | 2.70 / | 3.00 |
| PGD-25 | lb. | 1.25 / | 1.50 |
| Groco 30 | lb. | .1425/ | .1925 |
| Guantal | lb. | .62 / | .64 |
| Hyfac 410 | lb. | .1425/ | .1675 |
| 430 | lb. | .18 / | .205 |
| 431 | lb. | .2025/ | .2275 |
| Hystrene S-97 | lb. | .1863/ | .2125 |
| T-45 | lb. | .1638/ | .19 |
| T-70 | lb. | .1738/ | .20 |
| Industrene B | lb. | .1263/ | .1525 |
| R | lb. | .1138/ | .14 |
| 158 | lb. | .1313/ | .1575 |
| 254 | lb. | .1413/ | .1675 |
| 262 | lb. | .1513/ | .1775 |
| Laurex | lb. | .37 / | .39 |
| MODX | lb. | .295 / | .345 |
| NA-22 | lb. | 1.05 | |
| PND-70 | lb. | 1.35 / | 1.60 |
| Oleic acid, comml. | lb. | .185 / | .225 |
| Emersol 210 Elaine | lb. | .1425/ | .1925 |
| Groco 2, 4, 8, 18 | lb. | .1375/ | .1875 |
| Welcoline | lb. | .21 / | .42 |
| Plastone | lb. | .27 / | .30 |
| Polyac | lb. | 1.85 | |
| Ridacto | lb. | .25 / | .26 |
| Seedine | lb. | .1485/ | .1703 |
| Stearex Beads | lb. | .1488/ | .1588 |
| Stearic acid | | | |
| Emersol 120 | lb. | .1575/ | .1825 |
| 150 | lb. | .185 / | .21 |
| Hydrofoil 51 | lb. | .09 | |
| Hydrogenated, rubber grd. | | | |
| Groco 56 | lb. | .12 / | .145 |
| Rufat 75 | lb. | .1062/ | .1325 |
| Single pressed, comml. | lb. | .1475/ | .1675 |
| Emersol 110 | lb. | .1525/ | .1775 |
| Groco 53 | lb. | .1525/ | .1775 |
| Wilmar 253 | lb. | .1525/ | .1775 |
| Double pressed, comml. | lb. | .1525/ | .1725 |
| Groco 54 | lb. | .1575/ | .1825 |
| Wilmar 254 | lb. | .1575/ | .1825 |
| Triple pressed, comml. | lb. | .175 / | .195 |
| Groco 55 | lb. | .175 / | .20 |
| Wilmar 255 | lb. | .1875/ | .2075 |
| Sterene 60-R | lb. | .09 / | .1075 |
| Tonox | lb. | .54 / | .56 |
| Vimbra | lb. | .32 / | .385 |
| Vulklor | lb. | .88 / | .98 |
| Wilmar 110 | lb. | .17 / | .22 |
| 434 | lb. | .1425/ | .1925 |
| Zinc stearate, comml. | lb. | .39 / | .44 |

## Antioxidants

| | | | |
|---|---|---|---|
| AgeRite Alba | lb. | $2.40 / | $2.50 |
| Gel | lb. | .70 / | .72 |
| H. P. | lb. | .79 / | .80 |
| Hipar | lb. | 1.05 / | 1.07 |
| Powder | lb. | .57 / | .59 |
| Resin | lb. | .88 / | .90 |
| D | lb. | .57 / | .59 |
| Spar | lb. | .57 / | .59 |
| Stalite | lb. | .57 / | .59 |
| S | lb. | .57 / | .59 |
| Superlite | lb. | .57 / | .59 |
| White | lb. | 1.50 / | 1.60 |
| Akroflex C | lb. | .85 / | .87 |
| CD | lb. | .79 / | .81 |
| Albasan | lb. | .69 / | .73 |
| Alcogard 354 Powder | lb. | 1.50 / | 1.52 |
| Allied AA 1144 | lb. | .23 / | .24 |
| AA-1177 | lb. | .155 / | .165 |
| Aminox | lb. | .57 / | .59 |
| Antioxidant 425 | lb. | 2.47 / | 2.50 |
| 2246 | lb. | 1.50 / | 1.53 |
| Antisol | lb. | .23 / | .24 |
| Antisun | lb. | .15 / | .51 |
| Antox | lb. | .59 / | .61 |
| Aranox | lb. | 3.25 | |
| Betanox Special | lb. | .94 / | .96 |
| B-L-E, -25 | lb. | .57 / | .59 |
| Burgess Antisun Wax | lb. | .185 | |
| B-X-A | lb. | .55 / | .60 |
| CAO-1 | lb. | .37 / | .86 |
| -5 | lb. | 1.49 / | 1.63 |
| Copper Inhibiter X-872-L | lb. | 2.01 | |
| D-B-P-C | lb. | .91 / | 1.16 |
| Deenax | lb. | .95 | |
| Flectol H | lb. | .57 / | .59 |
| Flexamine | lb. | .79 / | .81 |
| Heliozone | lb. | .31 / | .32 |
| Ionol | lb. | .91 / | 1.65 |
| Microflake | lb. | .20 / | .24 |
| Naugawhite | lb. | .57 / | .59 |
| NBC | lb. | 1.67 | |
| Neozone A | lb. | .64 / | .66 |
| C | lb. | .86 / | .88 |
| D, Special | lb. | .57 / | .59 |
| Nevastaln A | lb. | .51 / | .61 |
| B | lb. | .51 / | .70 |
| Nonox CI | lb. | 1.50 / | 1.67 |
| WSL | lb. | 1.50 / | 1.60 |
| WSP | lb. | 1.47 / | 1.60 |
| Octamine | lb. | .57 / | .59 |
| PDA-10 | lb. | .46 / | .48 |
| Pennox A, C, D | lb. | .57 / | .59 |
| B | lb. | .67 / | .69 |
| Permalux | lb. | 2.25 | |
| Polygard | lb. | .57 / | .59 |
| Polylite | lb. | .55 / | .60 |
| Protector | lb. | .41 | |
| Rio Resin | lb. | .70 / | .72 |
| Santoflex | | | |
| 75 | lb. | 1.01 / | 1.03 |
| AW | lb. | .71 / | .73 |
| DD | lb. | .57 / | .59 |
| Santovar A | lb. | 1.55 / | 1.57 |
| Santowhite Crystals, Powd. | lb. | 1.55 / | 1.57 |
| L | lb. | .57 / | .59 |
| MK | lb. | 1.25 / | 1.27 |
| Stabilite | lb. | .55 / | .59 |
| Alba | lb. | .72 / | .79 |
| L | lb. | .60 / | .64 |
| White | lb. | .52 / | .60 |
| Powder | lb. | .41 / | .47 |
| Styphen I | lb. | .51 / | .55 |
| Sunolite #100 | lb. | .21 / | .23 |
| #127 | lb. | .17 / | .19 |
| Sunproof-713 | lb. | .26 / | .27 |
| Improved | lb. | .25 / | .26 |
| Jr. | lb. | .22 / | .23 |
| Tenamene 3 | lb. | .91 / | 1.05 |
| Thermoflex A | lb. | 1.05 / | 1.07 |
| Tonox | lb. | .54 / | .59 |
| Velvapex 51-250 | lb. | .40 | |
| V-G-B | lb. | .75 / | .80 |
| Zalba | lb. | 1.10 | |
| Zenite | lb. | .52 / | .54 |

## Antiozonants

| | | | |
|---|---|---|---|
| Eastozone 30, 31 | lb. | 1.05 / | 1.09 |
| 32 | lb. | 1.15 / | 1.20 |
| Flexone 3-C | lb. | 2.00 | |
| 6-H | lb. | 1.25 / | 1.27 |
| Nonox ZA | lb. | 1.99 / | 2.00 |
| Santoflex AW | lb. | .71 / | .73 |
| Tenamene 30, 31 | lb. | 1.24 / | 1.28 |
| Tysonite | lb. | .30 / | .3075 |
| UOP 88, 288 | lb. | 1.05 / | 1.07 |
| Wing-Stay S, T | lb. | .55 / | .67 |
| 100 | lb. | 1.00 / | 1.08 |

## Antiseptics

| | | | |
|---|---|---|---|
| Copper naphthenate, 6-8% | lb. | .245 | |
| Pentachlorophenol | lb. | .22 / | .30 |
| Resorcinol, technical | lb. | .775 / | .785 |
| Zinc naphthenate, 8-10% | lb. | .245 / | .30 |

## Blowing Agents

| | | | |
|---|---|---|---|
| Ammonium bicarbonate | lb. | .07 / | .09 |
| Carbonate | lb. | .16 | |

* Prices, in general, are f.o.b. works. Range indicates grade or quantity variations. No guarantee of these prices is made. Spot prices should be obtained from individual suppliers.

† For trade names, see Color—White, Zinc Oxides.

| | | | |
|---|---|---|---|
| Blowing Agent 81105 | lb. | $0.32 / | $0.35 |
| Celogen | lb. | 1.95 | |
| -80 | lb. | 1.60 | |
| -AZ | lb. | 1.92 | |
| Kempore R-125 | lb. | 1.92 | |
| Opex 40 | lb. | .72 | |
| PL-80 | lb. | 1.44 | |
| Sodium bicarbonate | 100 lbs. | 2.55 / | 3.85 |
| Carbonate, tech. | 100 lbs. | 1.35 / | 5.52 |
| Sponge Paste | lb. | .20 | |
| Unicel ND | lb. | .72 | |
| NDX | lb. | 1.44 | |
| S | lb. | .20 | |
| Vulcacel BN | lb. | 1.36 / | 1.51 |
| BMC | lb. | .68 / | .79 |

## Bonding Agents

| | | | |
|---|---|---|---|
| Braze | gal. | 6.00 / | 9.00 |
| Cover cement | gal. | 2.50 / | 4.00 |
| Chemlok 201, 203 | gal. | 5.00 / | 7.50 |
| 220 | gal. | 9.25 / | 12.00 |
| 401 | gal. | 11.70 / | 14.40 |
| 602 | gal. | 25.00 / | 26.00 |
| 607 | gal. | 18.00 | |
| 614 | lb. | 4.35 / | 4.75 |
| Flocking Adhesive RFA17, RFA22, RFA25 | lb. | .50 | |
| G-E Silicone Paste SS-15 | lb. | 4.52 / | 5.10 |
| SS-64 | lb. | 3.65 / | 6.75 |
| -67 Primer | lb. | 7.50 / | 12.50 |
| Gen-Tac Latex | lb. | .70 / | .805 |
| Hylene M | gal. | 3.50 / | 3.75 |
| M-50 | gal. | 1.90 / | 2.15 |
| Kalabond Adhesive | gal. | 6.50 / | 16.00 |
| Tie Cement | gal. | 2.00 / | 5.60 |
| Thixons | gal. | 1.48 / | 12 00 |
| Ty Ply, BN, O. S. UP, 3640 | gal. | 6.75 / | 8.00 |
| BC | lb. | 4.50 / | 6.00 |
| RC | gal. | 3.75 / | 5.00 |

## Brake Lining Saturants

| | | | |
|---|---|---|---|
| BRT 3 | lb. | .018 / | .0265 |
| Resinex L-S | lb. | .0225/ | .03 |

## Carbon Blacks‡

### Conductive Channel—CC

| | | | |
|---|---|---|---|
| Continental R-40 | lb. | .26 / | .35 |
| Kosmos/Dixie BB | lb. | .23 / | .30 |
| Texas MC-74-BD | lb. | .26 / | .35 |
| Voltex | lb. | .18 / | .315 |

### Easy Processing Channel—EPC

| | | | |
|---|---|---|---|
| Collocarb EPC | lb. | .059 / | .099 |
| Continental AA | lb. | .0775/ | .155 |
| Kosmobile 77/Dixiedensed 77 | lb. | .074 / | .1225 |
| Micronex W-6 | lb. | .0725/ | .155 |
| Spheron #9 | lb. | .085 / | .1625 |
| Texas E | lb. | .08 / | .1625 |
| Witco #12 | lb. | .0775/ | .155 |
| Wyex EPC | lb. | .08 / | .1625 |

### Hard Processing Channel—HPC

| | | | |
|---|---|---|---|
| HX HPC | lb. | .074 / | .1225 |
| Kosmobile S/Dixiedensed S | lb. | .074 / | .1225 |
| Micronex Mk. II | lb. | .0775/ | .145 |
| Witco #6 | lb. | .074 / | .1225 |

### Medium Processing Channel—MPC

| | | | |
|---|---|---|---|
| Arrow MPC | lb. | .08 / | .1625 |
| Continental A | lb. | .0775/ | .155 |
| Kosmobile S-66/Dixiedensed S-66 | lb. | .0775/ | .145 |
| Micronex Standard | lb. | .0725/ | .155 |
| Spheron #6 | lb. | .085 / | .1625 |
| Texas M | lb. | .08 / | .1625 |
| Witco #1 | lb. | .0775/ | .155 |

### Conductive Furnace—CF

| | | | |
|---|---|---|---|
| Aromex CF | lb. | .0875/ | .155 |
| Continex CF | lb. | .11 / | .17 |
| Vulcan C | lb. | .110 / | .185 |
| SC | lb. | .18 / | .255 |
| XC-72 | lb. | .25 / | .34 |

### Fast Extruding Furnace—FEF

| | | | |
|---|---|---|---|
| Arovel FEF | lb. | .0625/ | .135 |
| Continex FEF | lb. | .0675/ | .135 |
| Kosmos 50/Dixie 50 | lb. | .06 / | .10 |
| Philblack A | lb. | .0675/ | .135 |
| Statex M | lb. | .0625/ | .135 |
| Sterling SO | lb. | .0675/ | .135 |

### Fine Furnace—FF

| | | | |
|---|---|---|---|
| Statex B | lb. | .0675/ | .14 |
| Sterling 99 | lb. | .0725/ | .14 |

### High Abrasion Furnace—HAF

| | | | |
|---|---|---|---|
| Aromex HAF | lb. | .0725/ | .145 |
| Continex HAF | lb. | .0775/ | .145 |
| Kosmos 60/Dixie 60 | lb. | .079 / | .1175 |
| Philblack O | lb. | .0775/ | .145 |
| Statex R | lb. | .0725/ | .145 |
| Vulcan #3 | lb. | .0775/ | .145 |

### Intermediate Super Abrasion Furnace—ISAF

| | | | |
|---|---|---|---|
| Aromex ISAF | lb. | .0875/ | .16 |
| Continex ISAF | lb. | .0925/ | .16 |
| Kosmos 70/Dixie 70 | lb. | .10 / | .045 |
| Philblack I | lb. | .0925/ | .16 |
| Statex 125 | lb. | .0875/ | 16 |
| Vulcan 6 | lb. | .0925/ | .16 |

### General-Purpose Furnace—GPF

| | | | |
|---|---|---|---|
| Arogen GPF | lb. | $0.055 / | $0.1275 |
| Continex GPF | lb. | .06 / | .1275 |
| Statex G | lb. | .055 / | .1275 |
| Sterling V | lb. | .06 / | .1275 |
| Non-staining | lb. | .06 / | .1275 |

### High Modulus Furnace—HMF

| | | | |
|---|---|---|---|
| Collocarb HMF | lb. | .045 / | .085 |
| Continex HMF | lb. | .0625/ | .13 |
| Kosmos 40/Dixie 40 | lb. | .055 / | .095 |
| Modulex HMF | lb. | .0625/ | .13 |
| Statex 93 | lb. | .0575/ | .13 |
| Sterling L, LL | lb. | .0625/ | .13 |

### Semi-Reinforcing Furnace—SRF

| | | | |
|---|---|---|---|
| Collocarb SRF | lb. | .042 / | .082 |
| Continex SRF | lb. | .0575/ | .125 |
| Essex SRF | lb. | .0525/ | .125 |
| Furnex | lb. | .0525/ | .125 |
| Gastex | lb. | .0625/ | .135 |
| Kosmos 20/Dixie 20 | lb. | .0575/ | .0775 |
| Pelletex, NS | lb. | .0575/ | .125 |
| Sterling NS, S | lb. | .0575/ | .125 |
| R | lb. | .0625/ | .135 |

### Super Abrasion Furnace—SAF

| | | | |
|---|---|---|---|
| Philblack E | lb. | .115 / | .19 |
| Statex 160 | lb. | .11 / | .19 |
| Vulcan 9 | lb. | .115 / | .19 |

### Fine Thermal—FT

| | | | |
|---|---|---|---|
| P-33 | lb. | .0575/ | .1025 |
| Sterling FT | lb. | .0625 | |

### Medium Thermal—MT

| | | | |
|---|---|---|---|
| Sterling MT | lb. | .045 | |
| Non-staining | lb. | .055 | |
| Thermax | lb. | .04 / | .085 |
| Stainless | lb. | .05 / | .095 |

## Colors

### Black

| | | | |
|---|---|---|---|
| Iron oxides, comml. | lb. | .1235/ | .135 |
| BK—Lansco | lb. | .1275/ | .13 |
| Williams | lb. | .145 | |
| Lansco synthetic | lb. | .10 | |
| Mapico pure synthetic | lb. | .1475/ | .15 |
| Lampblack, comml. | lb. | .16 / | .45 |
| Superjet | lb. | .085 / | .12 |
| Permanent Blue | lb. | .80 / | 1.05 |
| Stan-Tone | lb. | .45 / | 1.20 |
| Vansul masterbatch | lb. | .60 / | .65 |
| Paste | lb. | .14 / | .15 |

### Blue

| | | | |
|---|---|---|---|
| Alkali Blue G, R | lb. | 2.38 | |
| C. P. Iran Blues | lb. | .52 / | .54 |
| Du Pont | lb. | 2.55 / | 4.75 |
| Filo | lb. | .28 | |
| Heveatex pastes | lb. | .80 / | 1.45 |
| Lansco ultramarines | lb. | .25 / | .28 |
| Monsanto Blue 7 | lb. | 1.55 | |
| 11 | lb. | 3.45 | |
| DPB-283 | lb. | 1.93 | |
| S-11 | lb. | 2.05 | |
| Permanent Blue | lb. | .80 / | 1.05 |
| Solfast | lb. | 1.60 / | 3.25 |
| Stan-Tone Violet Blue | | | |
| D-4000 | lb. | 3.45 | |
| 4001 | lb. | 3.00 | |
| 4002 | lb. | .90 | |
| 4900 | lb. | 1.97 / | 2.15 |
| Vansul masterbatch | lb. | .90 / | 2.70 |

### Brown

| | | | |
|---|---|---|---|
| Filo | lb. | .13 | |
| Iron oxides, comml. | lb. | .1425/ | .145 |
| Lansco synthetic | lb. | .125 | |
| Mapico Brown | lb. | .1575/ | .16 |
| Sienna, burnt, comml. | lb. | .0425/ | .155 |
| Williams | lb. | .115 / | .1775 |
| Raw, comml. | lb. | .045 / | .1325 |
| Williams | lb. | .08 / | .1725 |
| Umber, burnt, comml. | lb. | .06 / | .07 |
| Williams | lb. | .0725/ | .085 |
| Raw, comml. | lb. | .0625/ | .07 |
| Williams | lb. | .07 / | .0825 |
| Williams, pure brown | lb. | .155 | |
| Vandyke | lb. | .12 | |
| Mapico Tan | lb. | .2325/ | .235 |
| Metallic brown pure synthetic | lb. | .05 / | .06 |
| Vansul masterbatch | lb. | 2.10 / | 2.20 |

### Green

| | | | |
|---|---|---|---|
| Chrome | lb. | .42 / | .45 |
| Green | lb. | .80 / | 2.40 |
| Oxide | lb. | .3925/ | 1.10 |
| Cyanamid | lb. | .42 / | .44 |
| Green G | lb. | 3.00 | |
| Lincoln Green | lb. | 5.30 / | 6.60 |
| G-4099-6099 | lb. | .4525 | |
| GH-9869 | lb. | 1.10 / | 1.25 |
| 9976 | lb. | 1.20 / | 1.35 |
| Du Pont | lb. | 2.05 / | 2.80 |
| Filo | lb. | .40 | |
| Heveatex pastes | lb. | .95 / | 1.85 |
| Lansco Toner | lb. | 1.35 | |
| Monsanto Green 3 | lb. | 2.75 | |
| 14 | lb. | 1.45 | |
| 17 | lb. | 3.95 | |
| 71205 | lb. | 1.35 | |
| DGP | lb. | 2.03 | |
| S-17 | lb. | 2.25 | |

‡ At the request of the suppliers, the lowest prices shown for carbon blacks are for carloads in bags. Prices for hopper carloads are lower.

| | | | |
|---|---|---|---|
| Permansa | lb. | $1.45 | |
| Serene | lb. | 3.50 | |
| Solfast | lb. | 1.60 / | $3.35 |
| Stan-Tone | | | |
| D-5000 | lb. | 3.95 | |
| 5001 | lb. | .82 | |
| 5400 | lb. | 1.50 | |
| Vansul masterbatch | lb. | 2.00 / | 2.60 |

### Orange

| | | | |
|---|---|---|---|
| Benzidine 12193 | lb. | 3.30 | |
| Cyanamid Permatons | lb. | 1.50 / | 1.56 |
| Dianisidine 10406 | lb. | 2.85 | |
| Du Pont | lb. | 2.25 | |
| Molybdate | lb. | .49 | |
| Monsanto Orange 68187 | lb. | 2.90 | |
| Stan-Tone | | | |
| Light orange 70 PCO3 | lb. | 2.48 / | 2.76 |
| D-7003 | lb. | 3.97 / | 4.17 |
| Orange 70 PCO4 | lb. | 2.80 / | 3.08 |
| D-7004 | lb. | 4.23 / | 4.43 |
| 7104 | lb. | 1.85 / | 2.05 |
| Vansul masterbatch | lb. | 2.00 / | 2.60 |

### Red

| | | | |
|---|---|---|---|
| Antimony trisulfide | lb. | .285 / | .315 |
| R. M. P. No. 3 | lb. | .72 | |
| Sulfur Free | lb. | .78 | |
| Arcturus CP-1270 | lb. | 1.35 | |
| Brilliant Toning Red | lb. | .77 / | 1.90 |
| Cadmium red lithopones | lb. | 2.21 / | 3.77 |
| Cadmolith | lb. | 1.72 / | 2.20 |
| Cyanamid | lb. | .93 / | 1.90 |
| Naphthol Red, Scarlet | lb. | 2.95 / | 3.80 |
| Du Pont | lb. | 2.00 / | 2.05 |
| Filo | lb. | .11 | |
| Indian Red | lb. | .1275 | |
| Iron oxide, comml. | lb. | .06 / | .13 |
| Lansco synthetic | lb. | .1175 | |
| Mapico pure synthetic | lb. | .1425/ | .145 |
| Recco | lb. | .12 | |
| Williams Red | lb. | .13 / | .1525 |
| Lake Red C, CP-1104 | lb. | 1.25 | |
| Monsanto Maroon 113 | lb. | 1.50 | |
| 61148 | lb. | 1.75 | |
| Red 7 | lb. | 1.55 | |
| 41 | lb. | 4.40 | |
| 3501 | lb. | 1.15 | |
| 4004 | lb. | 1.50 | |
| 69191 | lb. | 3.38 | |
| Autumn | lb. | 1.10 | |
| PRP-285 | lb. | 1.27 | |
| S-44 | lb. | 1.28 | |
| Plasticone | lb. | 1.02 / | 4.60 |
| Rub-Er-Red | lb. | .0975 | |
| Solfast | lb. | 1.60 / | 1.80 |
| Stan-Tone | | | |
| 70 PCO5 | lb. | 3.00 / | 3.28 |
| D-2000 | lb. | 1.25 | |
| 2110, 2120, 2121 | lb. | .98 | |
| 2200 | lb. | 1.47 | |
| 2500 | lb. | 1.90 | |
| 2600 | lb. | 4.60 | |
| 2601 | lb. | 1.60 | |
| 2700 | | 1.75 | |
| 2800 | lb. | 1.90 | |
| Light Red D-7005 | lb. | 4.68 / | 4.88 |
| 7105 | lb. | 1.97 / | 2.17 |
| Red 70 PCO6 | lb. | 3.35 / | 3.63 |
| D-7006 | lb. | 4.89 / | 5.09 |
| -7106 | lb. | 2.20 / | 2.40 |
| Vansul masterbatch | lb. | .95 / | 3.30 |
| Venetian | lb. | .04 / | .0675 |

### White

| | | | |
|---|---|---|---|
| Antimony oxide | lb. | .27 / | .285 |
| Burgess Iceberg | ton | 50.00 / | 80.00 |
| Cryptone BT | lb. | .10 / | .11 |
| Permolith lithopone | lb. | .0825/ | .0912 |
| Titanium pigments | | | |
| Horse Head Anatase | lb. | .255 / | .27 |
| Rutile | lb. | .275 / | .29 |
| Rayox LW | lb. | .195 / | .205 |
| R-110 | lb. | .215 / | .225 |
| Ti-Cal | lb. | .075 / | .0825 |
| Ti-Pure | lb. | .195 / | .225 |
| Titanox A, AA, A-168 | lb. | .255 / | .265 |
| C-50 | lb. | .1438/ | .1488 |
| RA, -10, -50 | lb. | .275 / | .285 |
| RC | lb. | .0963/ | .1013 |
| -HT, -HTX | lb. | .0963/ | .0988 |
| Rutile | lb. | .205 / | .29 |
| Unitane | lb. | .255 / | .29 |
| Zopaque Anatase | lb. | .245 / | .27 |
| Zinc oxide, comml. | lb. | .145 / | .1825 |
| Azo ZZZ-11, -44, -55 | lb. | .145 / | .155 |
| 12% leaded | lb. | .125 / | .135 |
| 35% leaded | lb. | .15375/ | .16375 |
| 50% leaded | lb. | .1575/ | .1675 |
| Eagle AAA, lead free | lb. | .145 / | .155 |
| 5% leaded | lb. | .145 / | .155 |
| 35% leaded | lb. | .15375/ | .16375 |
| 50% leaded | lb. | .1575/ | .1675 |
| Florence Green Seal | lb. | .1625/ | .1725 |
| Red Seal | lb. | .1575/ | .1675 |
| White Seal | lb. | .1675/ | .1775 |
| Horsehead XX-4, -78 | lb. | .145 / | .155 |
| Kadox-15, -17, -72, -515 | lb. | .145 / | .155 |
| -25 | lb. | .15 / | .16 |
| Lehigh, 35% leaded | lb. | .15375/ | .16375 |
| 50% leaded | lb. | .1575/ | .1675 |
| Protox-166, -167 | lb. | .145 / | .155 |
| St. Joe, lead free | lb. | .145 / | .175 |
| Zinc sulfide, comml. | lb. | .253 / | .263 |
| Cryptone ZS | lb. | .253 / | .263 |

### Yellow

| | | | |
|---|---|---|---|
| Benzidine 12199 | lb. | $0.58 / | $2.55 |
| Cadmium yellow lithopones | lb. | 1.12 / | 1.15 |
| Cadmolith | lb. | 1.12 / | 1.20 |
| Chrome | lb. | .135 / | .145 |
| Cyanamid Hansa Yellow | lb. | .93 / | 1.22 |
| Du Pont | lb. | 2.25 | |
| Filo | lb. | .10 | |
| Iron oxide, comml | lb. | .0525 / | .1175 |
| Lansco synthetic | lb. | .1075 | |
| Mapico pure synthetic | lb. | .12 / | .1275 |
| Williams | lb. | .115 / | .1225 |
| Lightfast Benzidine 12220 | lb. | 3.40 | |
| Monsanto Yellow 14 | lb. | 1.91 | |
| 10010 | lb. | 1.91 | |
| BYP-282 | lb | 1.21 | |
| GA | lb. | 2.45 | |
| S-10010 | lb. | 1.17 | |
| Stan-Tone | | | |
| D-1100 | lb. | 2.55 | |
| 1101 | lb. | .69 | |
| Lemon 70 PCO1 | lb. | 1.77 / | 2.19 |
| D-7001 | lb. | 2.80 / | 3.00 |
| Medium yellow 70 PCO2 | lb. | 1.79 / | 2.21 |
| D-7002 | lb. | 2.98 / | 3.18 |
| Vansul masterbatch | lb. | .95 / | 1.95 |
| Williams Ocher | lb. | .0575/ | .06 |

### Dusting Agents

| | | | |
|---|---|---|---|
| Antidust | lb. | .405 / | .445 |
| Diatomaceous silica | ton | 32.00 / | 48.00 |
| Extrud-o-Lube, conc | gal. | 1.33 / | 1.69 |
| Glycerized Liquid Lubricant, concentrated | gal. | 1.25 / | 1.63 |
| Glyso-Lube, #3 | lb. | .14 | |
| Latex-Lube GR | lb. | .20 | |
| Pigmented | lb. | .1825 | |
| R-66 | lb. | .165 | |
| Liqui-Lube | lb. | .1625 | |
| N. T. | lb. | .1675 | |
| Liquizinc No. 305 | lb. | .30 / | .35 |
| Lubrex | lb. | .25 / | .30 |
| Mica 160 Biotite | lb. | .065 / | .0725 |
| Mesh | lb. | .08 / | .0875 |
| 325 Mesh | lb. | .0825/ | .09 |
| Concord | lb. | .08 / | .09 |
| Mineralite | ton | 45.00 | |
| Pigmented Separex, LG | lb. | .105 | |
| Slab-Dip, S-20 | lb. | .11 / | .15 |
| Pyrax A | ton | 14.50 / | 15.00 |
| W. A | ton | 17.00 / | 17.50 |
| Rexanol | lb. | .13 | |
| Talc, comml | ton | 18.40 / | 38.50 |
| EM | ton | 11.00 / | 63.00 |
| LS Silver | ton | 29.25 | |
| Nytals | ton | 28.00 / | 38.00 |
| Sierra Sagger 7 | ton | 34.00 | |
| White IR | ton | 19.75 | |
| III | ton | 20.75 | |
| Vanfre | gal. | 1.95 / | 3.00 |
| Wet-Zinc, CW, P | lb. | .20 / | .2225 |

### Extenders

| | | | |
|---|---|---|---|
| BRS 700 | lb. | .02 / | .036 |
| BRT 7 | lb. | .035 / | .036 |
| Cumar Resins | lb. | .095 / | .19 |
| Dielex B | lb. | .06 | |
| Factice, Amberex | lb. | .29 / | .36 |
| Brown | lb. | .1425/ | .263 |
| Neophax | lb. | .157 / | .268 |
| White | lb. | .144 / | .285 |
| G. B. Asphaltenes | lb. | .097 / | .177 |
| Millex, W | lb. | .07 | |
| Mineral Rubbers | | | |
| Black Diamond | ton | 38.00 / | 40.00 |
| Hard Hydrocarbon | ton | 46.50 / | 48.50 |
| Hydrocarbon MR | ton | 45.00 / | 55.00 |
| Parmr | ton | 21.00 / | 29.00 |
| T-MR Granulated | ton | 47.50 / | 50.00 |
| Nuba No. 1, 2 | lb. | .0575/ | .0625 |
| 3X | lb. | .0775/ | .0825 |
| OPD-101 | lb. | .26 | |
| Rubber substitute, brown | lb. | .16 / | .2572 |
| Car-Bel-Ex A | lb. | .14 | |
| Car-Bel-Lite | lb. | .35 | |
| Extender 600 | lb. | .1765 | |
| White | lb. | .192 / | .2103 |
| Stan-Shells | ton | 35.00 / | 73.00 |
| Sublac Resin PX-5 | lb. | .215 / | .235 |
| Sundex 53 | gal. | .12 | |
| 85 | gal. | .1725 | |
| Synthetic 100 | lb. | .41 | |
| Vistanex L grades | lb. | .35 | |

### Fillers, Inert

| | | | |
|---|---|---|---|
| Agrashell flour | ton | 50.00 / | 74.00 |
| Albacar | ton | 55.00 / | 75.00 |
| Barytes, floated, white | ton | 49.00 / | 70.85 |
| No. 1 | ton | 55.00 / | 77.50 |
| 2 | ton | 50.00 / | 72.50 |
| Off-color, domestic | ton | 25.00 | |
| Sparmite | ton | 95.00 / | 117.00 |
| Blanc fixe | ton | 100.00 / | 165.00 |
| Burgess HC-75 | ton | 12.00 / | 30.00 |
| 80 | ton | 14.00 / | 32.00 |
| Iceberg | ton | 50.00 / | 80.00 |
| Pigment #20 | ton | 35.00 / | 60.00 |
| #30 | ton | 37.00 / | 60.00 |
| WP #1 | ton | 11.00 / | 16.00 |
| Camel-Carb | ton | 14.00 | |
| -Tex | ton | 22.00 | |
| -Wite | ton | 35.00 | |
| Cary #200 | ton | 30.00 / | 55.00 |
| Citrus seed meal | lb. | .04 | |
| Oil | lb. | .15 | |

### Note

**Suppliers are requested to submit product additions or deletions and price changes promptly as they occur in order that we may make the listing of maximum service to our readers. Comments on the present listing and classifications are invited with a view toward facilitating location of specific items.**

Correspondence should be directed to Market Editor, RUBBER WORLD, 630 Third Avenue, New York 17, New York.

| | | | |
|---|---|---|---|
| Clays | | | |
| A. F. D. Filler | ton | $29.50 / | $36.00 |
| Aiken | ton | 14.00 | |
| Albacar | ton | 50.00 / | 55.00 |
| Champion | ton | 14.50 | |
| Crown | ton | 14.00 / | 33.00 |
| Dixie | ton | 14.50 | |
| Franklin | ton | 13.50 / | 35.25 |
| GK Soft Clay | ton | 11.00 | |
| Harwick | ton | 21.50 / | 77.00 |
| Hi-White R | ton | 10.00 / | 14.50 |
| Hydratex R | ton | 28.00 | |
| Kaolloid | ton | 10.50 | |
| LGB | ton | 13.00 / | 17.50 |
| LGP | ton | 15.50 / | 20.00 |
| McNamee | ton | 14.50 | |
| RX-43 | ton | 33.00 | |
| Natka 1200 | ton | 13.00 / | 36.00 |
| Par | ton | 12.00 | |
| Paragon | ton | 10.00 / | 14.50 |
| Polyfil | ton | 25.00 / | 45.00 |
| Recco | ton | 14.00 | |
| Sno-Brite | ton | 12.50 | |
| Stan-Clay | ton | 28.00 | |
| Stellar-R | ton | 50.00 | |
| Suprex | ton | 10.00 / | 14.50 |
| Swanee | ton | 12.50 | |
| Windsor | ton | 14.00 / | 30.00 |
| DC Silica | lb. | 1.15 / | 1.40 |
| Diatomaceous silica | ton | 32.00 / | 48.00 |
| Flocks | | | |
| Cotton, dark | lb. | .095 / | .135 |
| Dyed | lb. | .55 / | .60 |
| White | lb. | .13 / | .33 |
| Fabrifil X-24-G | lb. | .135 | |
| X-24-W | lb. | .235 | |
| Filfloc 6000 | lb. | .33 | |
| F-40-900 | lb. | .135 | |
| HSC #35 Silicone Emulsion | lb. | 1.22 / | 2.46 |
| Hydrite | ton | 25.00 / | 50.00 |
| Kalite | ton | 52.50 / | 67.50 |
| Lithopone, comml | lb. | .075 / | .085 |
| Eagle | lb. | .0725/ | .075 |
| Permolith | lb. | .08 / | .0875 |
| Sunolith | lb. | .075 / | .0825 |
| Mica, 160 Biotite | lb. | .065 / | .0725 |
| Mesh | lb. | .08 / | .0875 |
| 325 Mesh | lb. | .0825/ | .09 |
| Concord | lb. | .08 / | .09 |
| Millical | ton | 38.00 / | 53.00 |
| Mineralite | ton | 40.00 / | 60.00 |
| Non-Fer-Al | ton | 35.00 / | 50.00 |
| Ohio Superspray lime | ton | 16.50 | |
| Pulverized limestone, Stonelite | ton | 8.25 / | 11.00 |
| Purecal | ton | 56.75 / | 71.75 |
| Pyrax A | ton | 13.50 | |
| W. A | ton | 16.00 | |
| Sawdust | ton | 14.00 / | 35.00 |
| Silversheen Mica | lb. | .08 / | .09 |
| Stan White | ton | 10.50 / | 13.10 |
| Super-White Silica | ton | 25.00 / | 46.50 |
| Surfex | ton | 37.50 / | 52.50 |
| MM | ton | 42.00 / | 57.00 |
| Suspenso | ton | 38.00 / | 53.00 |
| Ti-Cal | lb. | .0675 | |
| Valron Estersil | lb. | 2.00 / | 2.25 |
| Walnut shell flours | ton | 50.00 / | 84.00 |
| Whiting, limestone | | | |
| Atomite | ton | 32.50 / | 35.00 |
| Calcite | ton | 23.00 | |
| Calwhite | ton | 20.00 / | 27.00 |
| -T | ton | 23.00 | |
| Duramite | ton | 20.00 | |
| Gamaco | ton | 32.50 / | 40.00 |
| Keystone | ton | 20.00 / | 22.00 |
| Laminar | ton | 30.00 | |
| No. 10 White | ton | 11.00 / | 16.50 |
| Omya | ton | 30.00 | |
| BSH | ton | 45.00 | |
| Paxinosa | ton | 14.50 / | 22.50 |
| Snowflake | ton | 17.00 / | 18.00 |
| Witco | ton | 13.00 | |
| York | ton | 9.50 | |

### Finishes

| | | | |
|---|---|---|---|
| Apex Bright Finish #5200-E | lb. | .25 | |
| Rubber Finish | gal. | 2.50 | |
| Black-out | gal. | 4.50 / | 8.00 |
| Flocks, Rayon, colored | lb. | $0.90 / | $1.50 |
| White | lb. | .75 / | 1.25 |
| *Also see Flocks, under Fillers, Inert* | | | |
| Paraflint RG and RGU Synthetic Wax | lb. | .15 / | .22 |
| Rubber lacquer, clear | gal. | 1.00 / | 2.00 |
| Shellacs, Angelo | lb. | .485 / | .7325 |
| Vac Dry | lb. | .485 / | .57 |
| Talc (*See Talc, under Dusting Agents*) | | | |
| Unidip | lb. | .15 / | .20 |
| Wax, Bees | lb. | .67 / | .83 |
| Carnauba | lb. | .57 / | 1.13 |
| Monten | lb. | .27 | |
| Neutral | gal. | .76 / | 1.31 |
| No. 118, colors | gal. | .86 / | 1.41 |
| Van Wax | gal. | 1.45 / | 1.50 |

### Latex Compounding Ingredients

| | | | |
|---|---|---|---|
| Acintol D, DLR | lb. | .0625/ | .085 |
| FA #1 | lb. | .0675/ | .09 |
| #2 | lb. | .0825/ | .105 |
| Accelerator 552 | lb. | 2.25 | |
| Accelerator J-117, -302 | lb. | 1.00 / | 1.15 |
| -144 | lb. | .15 / | .30 |
| -307 | lb. | 1.10 / | 1.25 |
| -311 | lb. | .60 / | .75 |
| Aerosol, dry types | lb. | .65 / | .80 |
| Liquid types | lb. | .40 / | .75 |
| Alcogard 354 | lb. | 1.40 / | 1.42 |
| Alcogum AK-12 | lb. | .12 / | .14 |
| AN-6 | lb. | .055 / | .06 |
| -10 | lb. | .09 / | .10 |
| -25 | lb. | .31 | |
| PA-15 | lb. | .16 | |
| Alrosol | lb. | .41 | |
| Amberex solutions | lb. | .1675/ | .18 |
| Antifoam J-114 | lb. | 3.25 / | 3.45 |
| P-242 | lb. | .24 / | .35 |
| Antioxidant J-137, -140 | lb. | .55 / | .70 |
| -139, -293 | lb. | 1.45 / | 1.60 |
| -182 | lb. | 2.00 / | 2.15 |
| -186 | lb. | 1.40 / | 1.55 |
| 2246 | lb. | 1.50 / | 1.53 |
| Anti Webbing Agent J-183 | lb. | .75 / | .90 |
| -297 | lb. | .27 / | .40 |
| Aquablak B | lb. | .0975/ | .1025 |
| G | lb. | .12 / | .125 |
| K | lb. | .12 / | .125 |
| M | lb. | .105 / | .11 |
| Aquarex D | lb. | .81 | |
| G | lb. | .21 | |
| L | lb. | .94 | |
| MDL | lb. | .33 | |
| ME | lb. | .82 | |
| Aquarex NS | lb. | .60 | |
| SMO | lb. | .50 | |
| WAQ | lb. | .22 | |
| Ben-A-Gels | lb. | .98 | 1.40 |
| Bentone 18, 18C | lb. | .45 | |
| 34 | lb. | .60 | |
| Casein | lb. | .22 | |
| Cellosize WP-09, -3, -40, -300 | lb. | 1.00 / | 1.17 |
| CW-12 | lb. | .85 | |
| -37 | lb. | .70 | |
| DC Antifoam A Compound | lb. | 5.45 / | 6.65 |
| B | lb. | .63 / | 1.10 |
| Emulsion | lb. | 2.05 / | 4.00 |
| AF Emulsion | lb. | 2.05 / | 2.85 |
| Compound 7 | lb. | 5.13 / | 6.50 |
| Defoama W-1701 | lb. | .125 | |
| Defoamer 115a | lb. | .50 | |
| NDW | lb. | .215 / | .235 |
| Dispersing Agents | | | |
| Blancol | lb. | .1525/ | .26 |
| N | lb. | .155 / | .26 |
| Darvan Nos. 1, 2, 3 | lb. | .22 / | .35 |
| No. 6 | lb. | .1525/ | .1575 |
| 7 | lb. | .1875/ | .2375 |
| Daxad 11, 21, 23, 27 | lb. | .08 / | .30 |
| Dispersaid H7A | lb. | .58 | |
| 1159 | lb. | .43 | |
| Emulphor ON-870 | lb. | .50 / | .70 |
| Igepal CO-630 | lb. | .2875/ | .47 |
| Igepon T-73 | lb. | .285 / | .495 |
| T-77 | lb. | .45 / | .69 |
| Indulins | lb. | .06 / | .08 |
| Kreelons | lb. | .132 / | .155 |
| Laurelton Oil | lb. | .18 | |
| Leonil SA | lb. | .52 / | .65 |
| Lomar PW | lb. | .18 | |
| Marasperse CB | lb. | .1225/ | .1425 |
| N | lb. | .095 / | .105 |
| Modicols | lb. | .17 / | .58 |
| Nekal BA-75 | lb. | .395 / | .54 |
| BX-76 | lb. | .63 / | .75 |
| Nopco 1287 | lb. | .155 / | .195 |
| Orzan A | lb. | .0325 | |
| S | lb. | .0425 | |
| Pluronics | lb. | .335 / | .40 |
| Polyfons | lb. | .08 / | .09 |
| Sorapon SF-78 | lb. | .28 / | .40 |
| Tergitol 7 | lb. | .4125/ | .44 |
| NPX | lb. | .275 / | .3074 |
| TMN | lb. | .2875/ | .32 |
| Trenmine W-30 | lb. | .15 | |
| W-40 | lb. | .60 / | .75 |
| Triton R-100 | lb. | .12 / | .25 |
| X-100, -102, -114 | lb. | .255 / | .36 |
| Dispersions | | | |
| Agebest 1293-22 | lb. | 1.90 / | 2.00 |
| AgeRite Alba | lb. | 3.00 | |
| Powder, Resin D | lb. | .80 | |
| White | lb. | 1.80 | |
| Altax | lb. | .75 | |
| Shield No. 2, 6 | lb. | .08 | |
| 3 | lb. | .095 | |
| 4-35 | lb. | .09 | |

| | | | |
|---|---|---|---|
| Dispersions (*Cont'd*) | | | |
| Altax Shield 5 | lb. | $0.093 | |
| 7-F, 8 | lb. | .165 | |
| 55 | lb. | .18 | |
| Iron Oxide, 60% | lb. | .40 | |
| L.S.W. | lb. | 1.50 | |
| No. 305 Liquizinc | lb. | .30 / | $0.35 |
| P-33 | lb. | .35 | |
| Rotax | lb. | .75 | |
| Sulfur | lb. | .13 / | .15 |
| Telloy | lb. | 3.62 | |
| Tuads, Methyl | lb. | 1.60 | |
| Vulcacure NB | lb. | .45 | |
| NS | lb. | .75 / | 1.05 |
| T.M.D. | lb. | 1.14 | |
| ZB, ZE, ZM | lb. | .85 / | .89 |
| Vulcanizing, C group | lb. | .40 / | 1.30 |
| G group | lb. | .45 / | .90 |
| N group | lb. | .40 / | 1.00 |
| Zetax | lb. | .75 | |
| Zimates, Butyl | lb. | 1.30 | |
| Ethyl, Methyl | lb. | 1.35 | |
| Zinc oxide | lb. | .40 | |
| Emulsions | | | |
| AgeRite Spar | lb. | 1.00 | |
| Stalite | lb. | .75 | |
| Superlite | lb. | 1.00 | |
| Borden Arcco A-25, A-26, 716-30 | lb. | .18 / | .19 |
| 555-40R | lb. | .185 / | .205 |
| 620-32B | lb. | .20 / | .21 |
| 716-35 | lb. | .17 / | .18 |
| 1041-21 | lb. | .165 / | .175 |
| Habuco Resin Nos. 502, 515, 523 | lb. | .195 / | .20 |
| 503 | lb. | .22 / | .225 |
| 504, 526 | lb. | .19 / | .195 |
| 517 | lb. | .175 / | .18 |
| 524 | lb. | .155 / | .16 |
| Resin A-2 | lb. | .16 / | .25 |
| P-370 | lb. | .175 / | .25 |
| X-210 | lb. | .12 / | .22 |
| Freeze-Stabilizer 322 | lb. | .40 | |
| 12116C | lb. | .52 | |
| Hyonic PE 250 | lb. | .255 / | .295 |
| Igepon T-43 | lb. | .145 / | .35 |
| T-51 | lb. | .125 / | .285 |
| -73 | lb. | .285 / | .495 |
| Ludox | lb. | .1675/ | .195 |
| Marmix | lb. | .41 / | .48 |
| Merac | lb. | .75 / | 1.05 |
| Micronex, colloidal | lb. | .06 / | .072 |
| Modical S | lb. | .3084/ | .3284 |
| VD | lb. | .1384/ | .1584 |
| Monsanto Blue 4685 WD | lb. | 1.60 | |
| Green 4884 WD | lb. | 1.80 | |
| Red 127 | lb. | 1.25 | |
| OPD 101 | lb. | .16 / | .26 |
| Picco Latex Plasticizer A-12 | lb. | .069 / | .096 |
| Pliolite Latex 150, 190 | lb. | .32 / | .41 |
| 170 | lb. | .37 / | .46 |
| Polyvinyl methyl ether | lb. | .25 / | .45 |
| Resin V | lb. | .13 | |
| Roelgel 100C | lb. | .46 | |
| Santomerse #3 Paste | lb. | .26 / | .30 |
| Sellogen Gel | lb. | .1275 | |
| Sequestrene AA | lb. | .905 / | .975 |
| ST | lb. | .585 / | .615 |
| 30A | lb. | .245 / | .265 |
| Setsit #5 | lb. | .75 / | 1.05 |
| D #9 | lb. | .85 / | 1.15 |
| Stablex A | lb. | .80 / | 1.10 |
| B, G | lb. | .50 / | .95 |
| K | lb. | .27 / | .35 |
| P | lb. | .35 / | .50 |
| T | lb. | .14 / | .22 |
| Surfactol 13 | lb. | .345 / | .36 |
| Vult-Accel E | lb. | .85 / | .92 |
| Webnix | lb. | 1.50 / | 2.50 |

## Mold Lubricants

| | | | |
|---|---|---|---|
| A-C Polyethylene | lb. | .30 / | .47 |
| Acintol D | lb. | .0625/ | .085 |
| Alipal CO-433 | lb. | .25 / | .45 |
| CO-436 | lb. | .22 / | .41 |
| Aquarex Compounds | lb. | .21 / | .94 |
| Carbowax 200, 300, 400 | lb. | .22 / | .25 |
| 1500 | lb. | .225 / | .2825 |
| 4000 | lb. | .31 / | .32 |
| 6000 | lb. | .35 / | .36 |
| Castorwax | lb. | .3375/ | .3575 |
| Colite Concentrate | gal. | .90 / | 1.15 |
| D-Tak Dip #10 | gal. | 1.50 | |
| DC Mold Release Fluid | lb. | 3.14 / | 4.75 |
| 200 Fluid | lb. | 3.14 / | 4.75 |
| Compound 4, 7 | lb. | 5.13 / | 6.50 |
| Emulsion 7 | lb. | 1.20 / | 1.74 |
| 8, 35, 35A, 35B, 36 | lb. | 1.20 / | 1.74 |
| ELA | lb. | .82 | |
| FT Wax 200 | lb. | .265 / | .42 |
| 300 | lb. | .295 / | .45 |
| Glycerized Liquid Lubricant, concentrated | gal. | 1.25 / | 1.63 |
| Igepals | lb. | .2875/ | .74 |
| Igepon AP-78 | lb. | .44 / | .68 |
| T-43 | lb. | .145 / | .35 |
| -51 | lb. | .125 / | .285 |
| -73 | lb. | .285 / | .495 |
| L-41 Diethyl Silicone Oil | lb. | 3.50 | |
| Lubrex | lb. | .27 / | .32 |
| Lubri-Flo | gal. | 10.00 / | 12.05 |
| Lustermold | lb. | .41 | |
| Mold Lubricant No. 426 | lb. | .18 | |
| Paste | lb. | .25 | |
| Monopole Oil | lb. | .16 | |
| Monten Wax | lb. | .57 | |
| MR-22 | gal. | 9.95 / | 14.95 |
| Para Lube | lb. | 0.46 / | .048 |
| Paraffint RG and RGU Synthetic Wax | lb. | $0.15 / | $0.22 |
| Plaskon 8406, 8407 | lb. | .30 / | .37 |
| 8416, 8417 | lb. | .35 / | .42 |
| 8429 | lb. | .40 / | .47 |
| Pluronics | lb. | .335 / | .44 |
| Poly-Brite PE-20 | lb. | .28 / | .42 |
| 600 | lb. | .42 / | .58 |
| Poly-Cone 125X | lb. | 1.20 / | 1.40 |
| 1000 | lb. | .93 / | 1.06 |
| Polyglycol E series | lb. | .29 / | .42 |
| RA-1, -2, -3 | gal. | 2.25 / | 3.00 |
| Rubber Glo | gal. | .94 / | .97 |
| Silrex S-1 | lb. | .65 | |
| SM-33, -55, -61, -62 | lb. | 1.22 / | 1.76 |
| Soap, Hawkeye | lb. | 1.25 / | 1.45 |
| Purity | lb. | .155 / | .165 |
| Sodium stearate | lb. | .40 | |
| Stoner's 700 series | gal. | 1.20 / | 1.25 |
| 800 series | gal. | 1.26 / | 1.70 |
| 900 series | gal. | 1.55 / | 2.55 |
| A series | gal. | 1.80 / | 4.50 |
| Ucon 50-HB Series | lb. | .25 / | .375 |
| Ulco | lb. | .12 / | .23 |
| Vanfre | gal. | 1.95 / | 3.00 |

## Odorants

| | | | |
|---|---|---|---|
| Alamasks | lb. | .75 / | 6.50 |
| Coumarin | lb. | 2.95 / | 3.55 |
| Ethavan | lb. | 6.75 / | 7.35 |
| Latex Perfume #7 | lb. | 4.00 | |
| Neutroleum Gamma | lb. | 3.60 | |
| Rodo | lb. | 4.00 / | 5.50 |
| Rubber Perfume #10 | lb. | 2.60 | |
| Vanillin, Monsanto | lb. | 3.00 / | 3.15 |

## Plasticizers and Softeners

| | | | |
|---|---|---|---|
| Acintol DLR | lb. | .0625/ | .085 |
| Adipol 2EH, 10A, XX | lb. | .40 / | .435 |
| BCA | lb. | .45 / | .475 |
| ODY | lb. | .43 / | .465 |
| Admex 710 | lb. | .3325/ | .3625 |
| 711 | lb. | .3325/ | .3825 |
| 744 | lb. | .3925/ | .3825 |
| Aro Lene #1980 | lb. | .10 / | .12 |
| Baker AA Oil | lb. | .195 / | .24 |
| Crystal O Oil | lb. | .21 / | .255 |
| Processed oils | lb. | .215 / | .235 |
| Bardol, 639 | lb. | .0275/ | .0375 |
| B | lb. | .055 / | .065 |
| Benzoflex 2-45 | lb. | .26 / | .29 |
| 9-88 | lb. | .27 / | .30 |
| Bondogen | lb. | .555 / | .605 |
| BRC-20 | lb. | .022 / | .0245 |
| 22 | lb. | .026 / | .0285 |
| 30 | lb. | .0165/ | .025 |
| 521 | lb. | .023 | |
| BRH 2 | lb. | .0341/ | .0351 |
| BRS 700 | lb. | .036 | |
| BRT 7 | lb. | .035 / | .036 |
| BRV | lb. | .0625/ | .065 |
| Bunarex Liquid | lb. | .0425/ | .0555 |
| Resins | lb. | .065 / | .1225 |
| Bunatak AH | lb. | .085 / | .095 |
| N | lb. | .31 | |
| U | lb. | .175 | |
| 83 | lb. | .0685 | |
| 90 | lb. | .09 | |
| 210 | lb. | .14 | |
| Bunnatol G, S | lb. | .40 / | .505 |
| Butac | lb. | .1485/ | .1585 |
| Butyl stearate, comml. | lb. | .255 | |
| B-17 | lb. | .21 / | .33 |
| Binney & Smith | lb. | .23 / | .26 |
| Harchem | lb. | .2525/ | .3425 |
| Kessoflex | lb. | .245 / | .275 |
| Ohio-Apex | lb. | .26 / | .29 |
| Butyl stearate—G.P. | lb. | .0125/ | .02 |
| R-100 | lb. | .045 / | .0525 |
| TT | lb. | .017 / | .02 |
| Califlux 510, 550 | lb. | .0275/ | .0375 |
| G.P. | lb. | .015 / | .0225 |
| R-100 | lb. | .0475/ | .0575 |
| T-T | lb. | .019 / | .0295 |
| Capryl alcohol, comml. | lb. | .195 / | .30 |
| Columbian Carbon | lb. | .195 / | .30 |
| Harchem | lb. | .195 / | .30 |
| Chlorowax 40 | lb. | .1625/ | .1825 |
| 70 | lb. | .185 / | .245 |
| -S | lb. | .21 / | .27 |
| Circo light | gal. | .17 | |
| Circosol-2XH | gal. | .185 | |
| Contogums | lb. | .0875/ | .111 |
| Cumar Resins | lb. | .065 / | .17 |
| DBM (dibutyl-m-cresol) Darax | lb. | .32 / | .3475 |
| DBP (dibutyl phthalate), comml. | lb. | .26 / | .40 |
| Darex | lb. | .30 / | .33 |
| Eastman | lb. | .26 / | .30 |
| Harflex 140 | lb. | .26 / | .40 |
| Harwick Std. Chem. Co. | lb. | .325 / | .385 |
| Hatco | lb. | .30 / | .33 |
| Monsanto | lb. | .285 / | .30 |
| Naugatuck | lb. | .30 / | .33 |
| Ohio-Apex | lb. | .26 / | .30 |
| PX-104 | lb. | .26 / | .30 |
| Rubber Corp. of America | lb. | .26 / | .44 |
| Sherwin-Williams | lb. | .30 / | .33 |
| DBS (dibutylsebacate) comml. | lb. | .66 / | .69 |
| Eastman | lb. | .655 / | .685 |
| Harflex 40 | lb. | .655 / | .745 |
| Hatco | lb. | .66 / | .685 |
| Monoplex | lb. | .66 / | .675 |
| Naugatuck | lb. | .665 / | .69 |
| PX-404 | lb. | .665 / | .685 |
| DCP (dicaprylphthalate), comml. | lb. | $0.295 / | $0.325 |
| Harflex 180 | lb. | .25 / | .39 |
| Hatco | lb. | .295 / | .325 |
| Monoplex | lb. | .30 / | .315 |
| DDA (didecyladipate) Good-rite GP-236 | lb. | .40 / | .55 |
| Kessoflex | lb. | .40 / | .435 |
| DDP (didecylphthalate) Good-rite GP-266 | lb. | .295 / | .45 |
| Hatco | lb. | .305 / | .435 |
| Defoamer X-3 | lb. | .355 | |
| DIBA (diisobutyladipate) Darex | lb. | .4325/ | .4625 |
| Eastman | lb. | .40 / | .44 |
| Ohio-Apex | lb. | .41 / | .445 |
| DIDA (diisodecyladipate) Monsanto | lb. | .40 / | .435 |
| RC | lb. | .40 / | .54 |
| DIDP (diisodecylphthalate) Darex | lb. | .32 / | .35 |
| Harflex 110 | lb. | .26 / | .40 |
| Monsanto | lb. | .285 / | .30 |
| Ohio-Apex | lb. | .26 / | .30 |
| PX-120 | lb. | .26 / | .30 |
| RC | lb. | .26 / | .43 |
| Dielex B | lb. | .06 | |
| Diethylene glycol, comml. | lb. | .1525/ | .1825 |
| Wyandotte | lb. | .15 / | .165 |
| Di-2 ethylhexyl azelate | lb. | .455 / | .495 |
| Dinopol IDO | lb. | .285 / | .32 |
| DIOA (diisooctyladipate) Harflex 220 | lb. | .40 / | .495 |
| Kessoflex | lb. | .40 / | .435 |
| Naugatuck | lb. | .435 / | .465 |
| PX-208 | lb. | .40 / | .435 |
| Rubber Corp. of America | lb. | .40 / | .54 |
| DIOP (diisooctylphthalate), comml. | lb. | .305 / | .335 |
| Darex | lb. | .32 / | .35 |
| Eastman | lb. | .25 / | .29 |
| Harflex 120 | lb. | .25 / | .39 |
| Hatco | lb. | .305 / | .335 |
| Monsanto | lb. | .275 / | .29 |
| Naugatuck | lb. | .305 / | .335 |
| Ohio-Apex | lb. | .25 / | .29 |
| PX-108 | lb. | .26 / | .30 |
| Rubber Corp. of America | lb. | .25 / | .43 |
| Sherwin-Williams | lb. | .32 / | .34 |
| DIOS (diisooctylsebacate), comml. | lb. | .61 / | .64 |
| Rubber Corp. of America | lb. | .5925/ | .70 |
| DIOZ (diisooctylazelate) Cabflex | lb. | .48 / | .51 |
| Dipolymer Oil | gal. | .33 / | .38 |
| Dispersing Oil No. 10 | lb. | .06 / | .0625 |
| DNODA (di-n-octyl-n-decyl adipate), Monsanto | lb. | .40 / | .435 |
| DOA (dioctyladipate), comml. | lb. | .425 / | .455 |
| Eastman | lb. | .40 / | .43 |
| Good-rite GP-233 | lb. | .40 / | .55 |
| Harflex 250 | lb. | .40 / | .495 |
| Hatco | lb. | .435 / | .465 |
| Monsanto | lb. | .425 / | .435 |
| Naugatuck | lb. | .435 / | .465 |
| PX-238 | lb. | .40 / | .435 |
| Rubber Corp. of America | lb. | .40 / | .54 |
| DOP (dioctylphthalate), comml. | lb. | .305 / | .335 |
| Darex | lb. | .32 / | .35 |
| Eastman | lb. | .28 / | .315 |
| Good-rite GP-261 | lb. | .285 / | .44 |
| Harflex 150 | lb. | .25 / | .39 |
| Hatco | lb. | .305 / | .335 |
| Monsanto | lb. | .275 / | .29 |
| Naugatuck | lb. | .305 / | .335 |
| Ohio-Apex | lb. | .25 / | .29 |
| Polycizer 162 | lb. | .28 / | .435 |
| PX-138 | lb. | .25 / | .29 |
| Rubber Corp. of America | lb. | .25 / | .43 |
| Sherwin-Williams | lb. | .305 / | .335 |
| DOS (dioctylsebacate) comml. | lb. | .61 / | .64 |
| Eastman | lb. | .61 / | .64 |
| Harflex 50 | lb. | .5925/ | .6825 |
| Hatco | lb. | .61 / | .635 |
| Monoplex | lb. | .61 / | .635 |
| Naugatuck | lb. | .615 / | .64 |
| PX-438 | lb. | .5925/ | .6225 |
| Rubber Corp. of America | lb. | .5925/ | .70 |
| Drapex 3.2 | lb. | .40 / | .54 |
| Dutch Boy NL-A10 (DBP) | lb. | .30 / | .33 |
| -A20 (DOP), A30 (DIOP) | lb. | .305 / | .335 |
| -A54 | lb. | .295 / | .325 |
| -C20 (DOS) | lb. | .61 / | .63 |
| -F21 | lb. | .395 / | .425 |
| -F31 | lb. | .44 / | .47 |
| -F41 | lb. | .48 / | .51 |
| Dutrex 6 | lb. | .025 / | .035 |
| Dymerex Resin | lb. | .135 / | .1475 |
| Elastex 36-R | lb. | .43 / | .4625 |
| 37-R | lb. | .70 / | .71 |
| Emulphor EL-719 | lb. | .52 / | .73 |
| Endor | lb. | .67 | |
| Ethox | lb. | .43 / | .455 |
| Ethylene glycol, comml. | lb. | .135 / | .165 |
| Wyandotte | lb. | .1325/ | .1425 |
| Flexol 3 GH | lb. | .44 / | .46 |
| 3 GO | lb. | .53 / | .55 |
| 4 GO | lb. | .325 / | .355 |
| 10-A | lb. | .425 / | .455 |
| 426 | lb. | .27 / | .30 |
| 810, 810X, 10-10, 10-10X | lb. | .305 / | .335 |
| TPF, A-26 | lb. | .435 / | .465 |
| Flexricin P-4 | lb. | .3475/ | .3625 |
| P-6 | lb. | .415 / | .43 |

| | | |
|---|---|---|
| Flexricin P-8 | lb. | $0.3475/ $0.3625 |
| PG-16 | lb. | .335 / .35 |
| Fortex | lb. | .125 / .145 |
| Fura-Tone NC 1008 | lb. | .28 |
| 1012 | lb. | .46 |
| G. B. Asphaltic Flux | gal. | .097 / .177 |
| Naphthenic Neutrals | gal. | .125 / .215 |
| Process oil, light | lb. | .0275/ .0375 |
| Medium | lb. | .0375/ .0475 |
| Galex W-100 | lb. | .155 / .18 |
| W-100 D | lb. | .1525/ .1775 |
| Gilsowax B | lb. | .0975/ .11 |
| Harchemex | lb. | .24 / .345 |
| Harflex 300 | lb. | .58 / .675 |
| 325 | lb. | .4325/ .52 |
| 375 | lb. | .7425/ .83 |
| 500 | lb. | .315 / .41 |
| HB-20 | lb. | .215 / .23 |
| -40 | lb. | .17 / .185 |
| Heavy Resin Oil | lb. | .0225/ .0375 |
| HSC-13 | lb. | .25 / .32 |
| -39 | lb. | .22 / .29 |
| Hycar 1312 | lb. | .60 |
| Kapsol | lb. | .33 / **.355** |
| Kenflex A, L | lb. | .26 / **.27** |
| B | lb. | .23 / .24 |
| N | lb. | .18 / .19 |
| Kessoflex 103 | lb. | .405 |
| 105 | lb. | .3325 |
| 106 | lb. | .38 |
| 107 | lb. | .525 |
| 110 | lb. | .24 |
| 111 | lb. | .28 |
| KP-23 | lb. | .325 / .335 |
| -90 | lb. | .40 / .435 |
| -140 | lb. | .46 / .485 |
| -201 | lb. | .45 / .465 |
| -220 | lb. | .33 / .365 |
| -555 | lb. | .59 / .60 |
| Kronisol | lb. | .34 / .375 |
| Kronitex AA, I, K-3, Mx | lb. | .325 / .36 |
| LX-685, -125, -135 | lb. | .125 / .135 |
| Marvinol plasticizers | lb. | .28 / .8825 |
| Methox | lb. | .375 / .40 |
| Millrex | lb | .15 |
| Monoplex S-38 | lb. | .215 / .24 |
| S-71 | lb | .45 / .475 |
| Morflex | lb. | .25 / .65 |
| Natac | lb. | .1435/ .1535 |
| Neoprene Peptizer P-12 | lb. | 1.05 |
| Nevillac | lb. | .31 / .85 |
| Neville R Resins | lb. | .145 / .205 |
| Nevinol | lb. | .24 |
| No. 1-D heavy oil | lb. | .065 |
| NP-10 | lb. | .44 / .48 |
| ODA (octyldecyladipate) | | |
| Good-rite GP-235 | lb. | .40 / .55 |
| Kessoflex | lb. | .40 / .435 |
| RC | lb. | .40 / .54 |
| ODP (octyldecylphthalate) | | |
| Good-rite GP-265 | lb. | .29 / .445 |
| Hatco | lb. | .305 / .335 |
| Rubber Corp. of America | lb. | .255 / .43 |
| Ohopex Q-10 | lb. | .265 / .305 |
| R-9 | lb. | .3525/ .3775 |
| Orthonitro benzophenol, comml. | lb. | .13 / .15 |
| Palmalene | lb. | .15 |
| Panaflex BN-1 | lb. | .185 / .225 |
| Panarez Resins | lb. | .09 / .14 |
| Para Flux, regular | gal. | .10 / .2125 |
| No. 2016 | gal. | .165 / .24 |
| 2332 | gal. | .11 |
| 4205 | lb. | .1075/ .2125 |
| Para Lube | lb. | .46 / .48 |
| Resins | lb. | .04 / .045 |
| Paradene Resins | lb. | .07 / .08 |
| Paraplex 5-B | lb. | .29 / .3475 |
| Al-111 | lb. | .32 / .3275 |
| G-25 | lb. | .76 / .77 |
| -40 | lb. | .4825/ .51 |
| -50 | lb. | .39 / .4175 |
| -53 | lb. | .4325/ .46 |
| -60 | lb. | .325 / .35 |
| -62 | lb. | .345 / .37 |
| RG-7 | lb. | .33 / .335 |
| -8 | lb. | .505 / .5125 |
| -10 | lb. | .52 / .5275 |
| Pepton 22 | lb. | .83 / .86 |
| 65 | lb. | 1.23 / 1.26 |
| 65-B | lb. | .83 / .86 |
| Phillrich 5 | gal. | .125 |
| Picco Resins | lb. | .1275/ .22 |
| 480 Oilproof Series | lb. | .18 / .23 |
| Aromatic Plasticizers | lb. | .05 / .065 |
| Liquid Resin D-165 (Y) | lb. | .06 / .075 |
| (Z-3) | lb. | .07 / .085 |
| (Z-6) | lb. | .08 / .095 |
| S. O. S. | gal. | .29 / .34 |
| Piccocizers | lb. | .04 / .055 |
| Piccolastic Resins | lb. | .16 / .25 |
| Piccolyte Resins | lb. | .205 / .245 |
| Piccopale Resins | lb. | .12 / .135 |
| Piccovars | lb. | .165 / .20 |
| Piccovol | lb. | .025 / .038 |
| Pictar | gal. | .25 / .30 |
| Pigmentar | lb. | .046 / .0634 |
| Pigmentaroil | lb. | .046 / .0634 |
| Pitch, Burgundy, Sunny South | lb. | .103 / .1085 |
| Pitt-Consol 500 | lb. | .28 / .305 |
| 640 | lb. | .42 |
| Plasticizers | | |
| 42 | lb. | .34 / .40 |
| 84 | lb. | .25 / .29 |
| B | lb. | .35 / .45 |
| DP-520 | lb. | .435 / .455 |
| MP | lb. | .035 / .0755 |
| MT-511 | lb. | .6925/ .7425 |
| ODN | lb. | $0.35 / $0.475 |
| SC | lb. | .38 / .55 |
| Plastoflex #3 | lb. | .52 / .57 |
| #520 | lb. | .36 / .435 |
| DBE | lb. | .50 / .55 |
| MGB | lb. | .29 / .37 |
| SP-2 | lb. | .43 / .48 |
| VS | lb. | .3575/ .3975 |
| Plastogen | lb. | .0875/ .09 |
| Plastone | lb. | .25 / .32 |
| Polycin 470 | lb. | .325 / .34 |
| Polycizers | lb. | .25 / .415 |
| 162 | lb. | .25 / .405 |
| Polymel-C | lb. | .1775/ .1875 |
| C-130, DX | lb. | .1375/ .1475 |
| D | lb. | .225 / .235 |
| D-TAC | lb. | .1975/ .215 |
| Poly-Sperse AP-2 | lb. | .23 / .295 |
| AP-300 | lb. | .26 / .325 |
| LC-20 | lb. | .26 / .325 |
| R-100 | lb. | .17 / .235 |
| PT Pine Tars | lb. | .038 / .0554 |
| 101 Pine Tar Oil | lb. | .038 / .0554 |
| Reogen | lb. | .1425/ .145 |
| Resin C pitch | lb. | .0225/ .031 |
| Resin R6-3 | lb. | .38 / .40 |
| Resinex 10, 25, 50, 110 | lb. | .04 / .045 |
| 70 | lb. | .0325/ .0375 |
| 85, 100 | lb. | .035 / .04 |
| 115 | lb. | .0375/ .0425 |
| L-2, L-3, L-4, L-5 | lb. | .0225/ .03 |
| Rosin Oil, Sunny South | gal. | .58 / .76 |
| RPA No. 2 | lb. | .85 |
| 3 | lb. | .51 |
| Conc. | lb. | .85 |
| 6 | lb. | 1.66 |
| RSN Flux | gal. | .10 / .91 |
| Rubber Oil B-5 | lb. | .0225/ .0355 |
| Rubberol | lb. | .18 / .2725 |
| Santicizer 1-H | lb. | .50 / .52 |
| 8 | lb. | .44 / .46 |
| 9 | lb. | .42 / .44 |
| 140 | lb. | .35 / .36 |
| 141 | lb. | .365 / .375 |
| 160 | lb. | .275 / .29 |
| 409 | lb. | .39 |
| 603 | lb. | .27 / .285 |
| B-16 | lb. | .4675/ .4775 |
| E-15 | lb. | .53 / .54 |
| Santocizer | lb. | .4275/ .4575 |
| Sebacic acid, purified, comml. | lb. | .59 / .65 |
| Binney & Smith | lb. | .64 / .76 |
| C. P.-Binney & Smith | lb. | .72 / .84 |
| Harchem | lb. | .655 / .815 |
| Sherolatum Petroleum | lb. | .05 / .10 |
| Softener #20 | gal. | .10 / .20 |
| Special Rubber Resin 100 | lb. | .1675/ .2175 |
| Staflex AX | lb. | .43 |
| DBES | lb. | .61 / .635 |
| Syn-Tac | gal. | .33 / .635 |
| Synthol | lb. | .17 / .2625 |
| Tetraflex R-122 | lb. | .245 / .285 |
| Thiokol TP-90B | lb. | .59 |
| -95 | lb. | .65 |
| Triacetin | lb. | .37 / .41 |
| Tributyl phosphate | lb. | .50 / .535 |
| Tributyrin | lb. | .69 |
| Tricresyl phosphate, comml. | lb. | .33 / .36 |
| Monsanto | lb. | .35 / .36 |
| Naugatuck | lb. | .33 / .36 |
| PX-917 | lb. | .33 / .36 |
| Triphenyl phosphate, comml. | lb. | .39 / .40 |
| Monsanto | lb. | .415 / .435 |
| Turgum S | lb. | .131 / .141 |
| SB | lb. | .095 / .105 |
| Turpol NC 1200 | lb. | .61 / .70 |
| Tysonite | lb. | .3025/ .305 |
| United | gal. | .69 / 1.20 |
| X-1 Resinous Oil | lb. | .0225/ .0325 |

## Reclaiming Oils

| | | |
|---|---|---|
| Bardol, 639 | lb. | .0275/ .0375 |
| B | lb. | .055 / .065 |
| BRH 2 | lb. | .0213/ .0351 |
| BRT 3 | lb. | .02 / .031 |
| 4 | lb. | .02 / .031 |
| 7 | lb. | .035 / .036 |
| BRV | lb. | .0625/ .065 |
| Burco-RA | lb. | .053 / .0805 |
| BWH-1 | lb. | .16 / .17 |
| Dipolymer Oil | gal. | .33 / .43 |
| Dispersing Oil No. 10 | lb. | .06 / .0625 |
| G. B. Oils | gal. | .115 / .275 |
| Heavy Resin Oil | lb. | .0225/ .0375 |
| LX-572 | gal. | .27 / .32 |
| -759 | gal. | .1375 |
| -777, -809, -859 | gal. | .23 / .33 |
| -869 | gal. | .33 / .43 |
| -871 | gal. | .34 / .44 |
| No. 3186 | gal. | .28 / .295 |
| Picco 6535 | gal. | .25 / .30 |
| C-33 | gal. | .215 / .315 |
| -42 | gal. | .23 / .33 |
| D-4 | gal. | .27 / .37 |
| E-5 | gal. | .25 / .35 |
| Q-Oil | gal. | .286 / .36 |
| Pitt-Consol 500 | lb. | .28 / .305 |
| 640 | lb. | .42 |
| PT 101 Pine Tar Oil | lb. | .038 / .0554 |
| Reclaiming Oil #3186 | gal. | .28 / .385 |
| -G | gal. | .25 / .365 |
| 4039-M | gal. | .3275/ .3975 |
| -Y | gal. | .30 / .37 |
| RR-10 | lb. | .37 |
| S. R. O. | lb. | .015 / .0225 |
| X-1 Resinous Oil | lb. | .0225/ .0325 |

## Reinforcers, Other Than Carbon Black

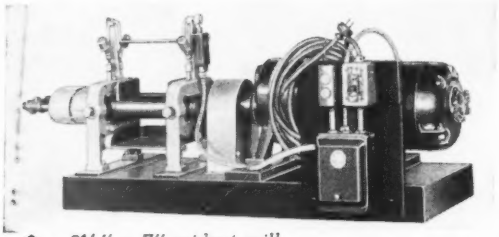
| | | |
|---|---|---|
| Angelo Shellacs | lb. | $0.485 / $0.7325 |
| Borden, Chem. Div. | | |
| Arcco 978-42B | lb. | .18 / .19 |
| 1073-18B | lb. | .135 / .145 |
| 1294-36B | lb. | .115 / .125 |
| 1301-12B | lb. | .15 / .16 |
| BRC-20 | lb. | .0235/ .0245 |
| 22 | lb. | .026 / .0285 |
| 30 | lb. | .0165/ .025 |
| 521 | lb. | .023 |
| Bunarex Resins | lb. | .065 / .1225 |
| Cab-o-sil | lb. | .66 / 1.45 |
| Calcene CO | ton | 105.00 / 125.00 |
| NC | ton | 80.00 / 100.00 |
| TM | ton | 82.50 / 102.50 |
| Car-Bel-Rez C | lb. | .126 / .1451 |
| Clays | | |
| Aiken | ton | 14.00 |
| Buca | ton | 45.00 |
| Burgess Iceberg | ton | 50.00 / 80.00 |
| Icecap K | ton | 65.00 / 90.00 |
| Burgess Pigment #20 | ton | 35.00 / 60.00 |
| #30 | ton | 37.00 / 60.00 |
| Catalpo | ton | 35.00 |
| Crown | ton | 14.00 / 33.00 |
| Dixie | ton | 14.50 |
| Franklin | ton | 13.50 / 35.25 |
| L. G. B. | ton | 13.00 / 17.50 |
| McNamee | ton | 14.50 |
| Par | ton | 15.00 |
| Paragon | ton | 10.00 / 14.50 |
| Pigment No. 33 | ton | 37.00 |
| Polyfil C | ton | 25.00 |
| Recco | ton | 14.00 |
| Suprex | ton | 10.00 / 14.50 |
| Swanee | ton | 12.50 |
| Whitetex | ton | 50.00 |
| Windsor | ton | 14.00 / 30.00 |
| Witco No. 1 | ton | 14.00 / 30.00 |
| No. 2 | ton | 13.50 / 30.00 |
| Clearcarb | lb. | .1175/ .1255 |
| Cumar Resins | lb. | .095 / .19 |
| Darex Resins | lb. | .42 / .49 |
| DC Silica | lb. | 1.15 / 1.40 |
| Diatomaceous silica | ton | 32.00 / 48.00 |
| Good-rite 2007 | lb. | .36 / .38 |
| 2057 | lb. | .30 / .31 |
| Hi-Sil 233 | lb. | .0825/ .0975 |
| X303 | lb. | .40 / .45 |
| Hycar 2001 | lb. | .55 |
| 2007 | lb. | .39 |
| Indulins | lb. | .06 / .08 |
| Kralac A-EP | lb. | .43 / .54 |
| Laminar | ton | 30.00 |
| Magnesium carbonate | | |
| Marinco CL | lb. | .11 / .14 |
| Marbon Resins | lb. | .36 / .43 |
| Multifex MM | ton | 117.50 / 137.50 |
| Super | ton | 167.50 / 187.50 |
| Neville Resins | | |
| 465 | lb. | .075 / .08 |
| LX-509 | lb. | .33 / .35 |
| Nebony | lb. | .045 / .05 |
| Paradene | lb. | .07 / .08 |
| R | lb. | .145 / .205 |
| Para Resins 2457 | lb. | .04 / .045 |
| Parapol S-Polymers | lb. | .44 |
| Picco Resins | lb. | .1275/ .22 |
| Piccolyte Resins | lb. | .2225/ .2525 |
| Piccoumaron Resins | lb. | .07 / .195 |
| Piccovars | lb. | .145 / .20 |
| Pliolite NR types | lb. | .98 / 1.33 |
| S-3 | lb. | .42 / .49 |
| -6 | lb. | .36 / .43 |
| B | lb. | .36 / .43 |
| E | lb. | .36 / .43 |
| Plio-Tuf G85C | lb. | .52 / .59 |
| Purecal M | ton | 56.75 / 71.75 |
| SC, T | ton | 110.00 / 125.00 |
| U | ton | 120.00 / 135.00 |
| R-B-H 510 | lb. | .15 / .22 |
| Resinex | lb. | .0375/ .0525 |
| Rubber Resin LM-4 | lb. | .28 / .35 |
| Silene EF | lb. | .06 / .07 |
| L | lb. | .0575/ .0675 |
| Silvacons | ton | 55.00 / 85.00 |
| Transphalt | lb. | .0375/ .0575 |
| Witcarb P | ton | 117.50 / 153.50 |
| R | ton | 127.50 / 163.50 |
| Regular | ton | 60.00 / 96.00 |
| Zeolex 23 | lb. | .06 / .07 |
| Zinc oxide, commercial† | lb. | .145 / .155 |

## Retarders

| | | |
|---|---|---|
| Benzoic acid TBAO-2 | lb. | .44 |
| Good-rite Vultrol | lb. | .62 / .66 |
| R-17 Resin | lb. | .1075/ .36 |
| Retarder ASA | lb. | .57 |
| E-S-E-N | lb. | .39 / .41 |
| J | lb. | .68 / .70 |
| PD | lb. | .39 / .41 |
| W | lb. | .46 / |
| Retardex | lb. | .47 / .50 |
| Thionex | lb. | 1.14 |
| Wiltrol P | lb. | .37 / .39 |

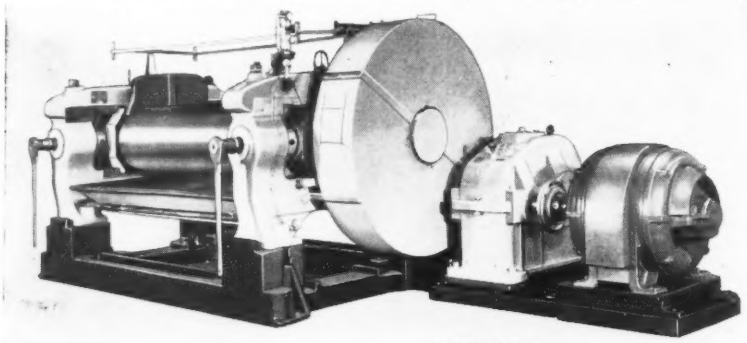
## Solvents

| | | |
|---|---|---|
| Bondogen | lb. | .555 / .605 |
| Butyrolactone | lb. | .60 / .65 |
| Cosol #1 | gal. | .37 / .43 |
| #2 | gal. | .42 / .48 |
| Dichloro Pentanes | lb. | .04 / .07 |
| Dipentene DD, Sunny South | gal. | .42 / .63 |
| Ethylene dichloride, comml. | lb. | .09 / .122 |



2½" x 7" midget mill.
No. 8, 22" and 26" diameter rolls.

ALL THE WAY
UP
AND
DOWN...



# from Very Small Laboratory Models to the Largest Production Sizes

*ELEVEN SIZES OF MODERN MILLS*

• • •

Laboratory
•
Experimental-Production
•
Production

• • •

2½" x 7" through 26" & 26" by 100" roll diameters and widths.

Stewart Bolling

Whatever your needs for mill equipment, whether production or experimentation, Stewart Bolling can fill them to your profitable advantage. That goes for both rubber and plastics. In particular, we believe the range of our laboratory mills to be the most extensive in the world today. Bolling ULTRA Model Laboratory Mills are ideal mechanically for their purpose; exterior-wise, their finesse contributes to the finest plant environment.

Look into the advantages of the Bolling ULTRA Model Laboratory Mill with dual drive, with each roll separately and infinitely variable in speeds over an 8-to-1 range. Options are many. Special mills, already numerous in Bolling's long experience, will be gladly designed to meet your individual conditions.

**Stewart Bolling**
& Company, Inc.

*Ask for our well illustrated Catalog 58-M.*

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*Designers and Builders of Machinery for the Rubber and Plastics Industries*

Intensive Mixers • Calenders • Mills • Refiners • Crackers • Dust Grinders • Sheeters
Hydraulic Presses • Pump Units • Accumulators • Elevators • Bale Splitters • Vulcanizers
Speed Reducers • Gears • Extruders


| | | | |
|---|---|---|---|
| Hi-Flash 2-50-W | gal. | $0.41 | |
| Pale yellow | gal. | .39 | |
| LX-572 | gal. | .27 / | $0.32 |
| -748 | gal. | .16 / | .23 |
| Methyl-2-pyrrolidone | lb. | .75 / | .80 |
| Neville Nos. 100, 104 | gal. | .52 / | .60 |
| 106 | gal. | .38 / | .46 |
| Nevsolv H, 200 | gal. | .19 / | .29 |
| HF, T, 30 | gal. | .24 / | .34 |
| Penetrell | gal. | .42 / | .63 |
| Picco Hi-Solv Solvents | gal. | .16 / | .48 |
| Pine Oil DD, Sunny South | lb. | .15 | |
| Skellysolve-B | gal. | .17 | |
| -C | gal. | .162 | |
| -H | gal. | .148 | |
| -R, -V | gal. | .139 | |
| Stauffer Carbon Disulfide | lb. | .0525/ | .085 |
| Tetrachloride | lb. | .0825/ | .475 |

**Tackifiers**

| | | | |
|---|---|---|---|
| Actinol DLR | lb. | .0625/ | .085 |
| Bardol, 639 | lb. | .0275/ | .0375 |
| Borden, Arcco | | | |
| A25, A26, 716-30 | w. | .18 / | .19 |
| 555-40R | lb. | .185 / | .205 |
| 620-32B | lb. | .20 / | .21 |
| 716-35 | lb. | .17 / | .18 |
| 1041-21 | lb. | .165 / | .175 |
| BRH 2 | lb. | .0213/ | .0351 |
| Bunarex Resins | lb. | .065 / | .1225 |
| Bunaweld 480 | lb. | .24 | |
| Chlorowax 70 | lb. | .18 / | .24 |
| Contogums | lb. | .0875/ | .11 |
| Cumar Resins | lb. | .095 / | .19 |
| Galex W-100 | lb. | .155 / | .17 |
| W-100D | lb. | .1525/ | .1625 |
| Indopol H-35 | gal. | .65 / | .84 |
| H-50 | gal. | .70 / | .89 |
| -100 | gal. | .85 / | 1.08 |
| -300 | gal. | 1.00 / | 1.24 |
| -1500 | gal. | 1.48 | |
| L-10 | gal. | .40 / | .59 |
| -50 | gal. | .45 / | .64 |
| -100 | gal. | .55 / | .74 |
| Kenflex resins | lb. | .18 / | .27 |
| Koresin | lb. | .90 / | 1.10 |
| Natac | lb. | .12 / | .13 |
| Nevindene | lb. | .15 / | .18 |
| Picco Resins | lb. | .1275/ | .22 |
| Piccolastic Resins | lb. | .1855/ | .34 |
| Piccolyte Resins | lb. | .2225/ | .2525 |
| Piccopale Resins | lb. | .089 / | .13 |
| Piccoumaron Resins | lb. | .07 / | .185 |
| R-B-H 510 | lb. | .15 / | .22 |
| Roelflex 1118A | lb. | .39 | |
| Synthetic 100 | lb. | .41 | |
| Synthol | lb. | .17 / | .2625 |
| United | gal. | .69 / | 1.20 |
| Vistanex, LM grades | lb. | .45 | |

**Vulcanizing Agents**

| | | | |
|---|---|---|---|
| Dibenzo G-M-F | lb. | 2.60 | |
| G-M-F #113, #117 | lb. | .90 | |
| Di-Cup | lb. | 1.10 | |
| Dodecenylsuccinicanhydride | lb. | .75 / | .76 |
| HMDA-Carbamate | lb. | 4.50 / | 4.90 |
| Ko-Blend I, S | lb. | .39 | |
| Litharge (*See Accelerator-Activators, Inorganic*) | | | |
| Magnesium oxide | lb. | .2525/ | .38 |
| Maglite D, K, Y | lb. | .2525/ | .305 |
| L | lb. | .2975/ | .3225 |
| M | lb. | .27 / | .32 |
| Marmag | lb. | .2475/ | .295 |
| Michigan No. 1782 | lb. | .2525/ | .30 |
| PSD 85 | lb. | .37 / | .50 |
| Red Lead (*See Accelerator-Activators, Inorganic*) | | | |
| Sulfasan R | lb. | 1.55 | |
| Sulfur flour, commil | 100 lbs. | 2.55 / | 3.30 |
| 1018 | lb. | .12 / | .1575 |
| Aero | 100 lbs. | 2.40 / | 7.75 |
| Crystex | lb. | .195 / | .23 |
| Insoluble 60 | lb. | .125 / | .13 |
| Rubbermakers | 100 lbs. | 2.65 / | 4.55 |
| Stauffer | lb. | .0265/ | .054 |
| Telloy | lb. | 3.50 | |
| VA-7 | lb. | .50 | |
| Vandex | lb. | 7.00 | |
| Vultac No. 2 | lb. | .47 / | .74 |
| 3 | lb. | .51 / | .78 |
| White lead silicate (*See Accelerator-Activators, Inorganic*) | | | |

## Synthetic Rubbers

*(Continued from page 878)*

**Cold SBR Oil-Black Masterbatch**

| | | |
|---|---|---|
| Ameripol 1805 | $0.155[e] / | $0.161[e] |
| 4750 | .1545[e] / | .1605[e] |
| 4751 | .140[e] / | .146[e] |
| 4752 | .160[e] / | .166[e] |
| 4753 | .148[e] / | .154[e] |
| Baytown 1801 | | .176[b] |
| Carbomix 3751, 3758 | .1545[e]/ | .1605[e] |
| 3753, 3759 | .164[e] / | .170[e] |
| 3755 | .147[e] / | .153[e] |
| 3756 | .1576[e]/ | .1636[e] |
| 3757 | .148[e] / | .154[e] |
| Gentro-Jet 9250 | | .158 |
| 9251 | | .164 |

| | | |
|---|---|---|
| Gentro-Jet 9252 | | $0.167 |
| 9275 | | .150 |
| OB-102 | | .1825[a] |
| -104 | | .1475[a] |
| -106 | | .151[a] |
| -110 | | .141[a] |
| -111 | | .154[a] |
| -113 | | .175[a] |
| -114C | | .142[a] |
| Philprene 1803 | $0.174[b] / | .18[b] |
| 1805 | .155[b] / | .161[b] |
| 6604 | .208[b] / | .214[b] |
| 6608 | .146[b] / | .152[b] |
| 6661 | .182[b] / | .188[b] |
| 6662 | .1845[b]/ | .1905[b] |
| 6682 | .148[b] / | .154[b] |
| S-1803 | | .165[a] |
| -1804 | | .175[a] |
| Synpol 8250 | .174[b] / | .18[b] |
| 8253 | .1584[b]/ | .1644[b] |
| 8254 | .1545[b]/ | .1605[b] |
| 8255 | .148[b] / | .154[b] |
| 8266 | .1598[b]/ | .1658[b] |

**Cold SBR Rosin Masterbatch**

| | | |
|---|---|---|
| Copo 3900 | .231[c] / | .237[c] |

**Cold SBR Latex**

| | | |
|---|---|---|
| CL-101 | | .28[a] |
| Copo 2101 | .30[c] / | .4025[c] |
| 2102, 2105, 2110, 3851 | .32[c] / | .3725[c] |
| 2108 | .30[c] / | .3675[c] |
| 2109 | .2775[c]/ | .3450[c] |
| 3852 | .2900[c]/ | .3500[c] |
| FR-S 2105 | .32[c] / | .366[c] |
| Naugatex 2105, 2107 | .32[a] / | .38[a] |
| 2108 | .30[a] / | .38[a] |
| 2113 | .29[a] / | .36[a] |
| Pliolite Latex 2101 | | .30[c] |
| 2105, 2107 | | .32[c] |
| 2108 | | .30[c] |
| Polysar Latex 721 | | .32[c] |
| S-2101 | | .26[a] |
| -2105 | | .28[a] |
| -2107 | | .32[a] |
| -2108 | | .29[a] |

**Misc. SBR**

| | | |
|---|---|---|
| FR-S-110 (latex) | .3000[c] | |
| -150 (latex) | .3000[c] | |
| -174 (latex) | .2950[c] | |
| -176 (latex) | .2775[c] | |
| -182 | .241[c] / | .247[c] |
| -184 | .1885[c]/ | .1945[c] |

**Urethane Types**

| | | |
|---|---|---|
| Adiprene L, LD-167,-213 | 1.15 / | 1.65 |

## Industrial Fabrics

*(Continued from page 877)*

it is reported. Currently, calls for additional cotton goods indicate that in numerous manufacturing divisions a speed-up in finished product output is occurring.

**Industrial Fabrics**

**Drills***

| | | |
|---|---|---|
| 59-inch, 1.85, 68x40 | *yd.* | $0.40 |
| 2.25, 68x40 | | .34 |

**Broken Twills***

| | | |
|---|---|---|
| 54-inch, 1.14, 76x52 | *yd.* | .52 |
| 58-inch, 1.06, 76x52 | | .585 |
| 60-inch, 1.02, 76x52 | | .5825 |

**Osnaburgs***

| | | |
|---|---|---|
| 40-inch, 2.11, 35x25 | *yd.* | .2275 |
| 3.65, 35x25 | | .1525 |
| 59-inch, 2.35, 32x26 | | .30 |
| 62-inch, 2.23, 32x26 | | .31 |

**Ducks**

**Numbered Duck†**

List less 45%

**Enameling Ducks***

| | S. F. | D. F. |
|---|---|---|
| 38-inch, 1.78 yd. | $0.3263 | .3313 |
| 2.00 yd. | .275 | .33 |
| 51.5-inch, 1.35 yd. | .4738 | .4888 |
| 57-inch, 1.22 yd. | .4838 | .50 |
| 61.5-inch, 1.09 yd. | .5413 | .5538 |

**Hose and Belting Ducks***

| | | |
|---|---|---|
| Basis | *lb.* | .67 |


FOR EVERY POLYURETHANE FOAM PROCESS, THERE'S A UNION CARBIDE SILICONE SURFACTANT

Check Here

**One shot, water blown flexible polyether** foam requires 0.3 to 0.8% of UNION CARBIDE Surfactant L-520. No other surfactant gives the good stable rise, open cells and fine pores so necessary for high quality use such as cushioning.

**One shot, fluorocarbon blown flexible polyether** foam for extra soft pillows is almost impossible without UNION CARBIDE Surfactant L-520. Gives a good stable rise, too. Concentrations up to 1.5%.

**One shot, rigid polyester** foam, such as used for structural purposes, has virtually 100% closed cells with only 0.1 to 0.5% of XL-521.

**Prepolymer, flexible polyether** foam has 85% open cells, uniform structure when 10 or 50 cstk. UNION CARBIDE L-45 is used.

**Prepolymer, semi-rigid polyether** foam, such as required in crash-pad applications, is best made with about 1 to 2% of UNION CARBIDE LE-452 metered in at the foam machine.

**Prepolymer, fluorocarbon blown rigid polyester** foam, of the type used in refrigerator insulation, is 90% closed cells, has good rise and fine pores if made using between 0.1 and 0.5% of UNION CARBIDE XL-521 added to the prepolymer side. Closed cells hold fluorocarbon gas for low thermal conductivity.

**LIKE TO KNOW MORE?** Samples of these special silicone surfactants and Silicones Man technical aid from Dept. CS-4902, Silicones Division, Union Carbide Corporation, 30 East 42nd St., New York 17, N.Y. *(In Canada:* Union Carbide Canada Limited, Toronto 7.)

UNION CARBIDE SILICONES

**Unlocking the secrets of silicones**

**Rubber, Monomers, Resins, Oils and Emulsions**

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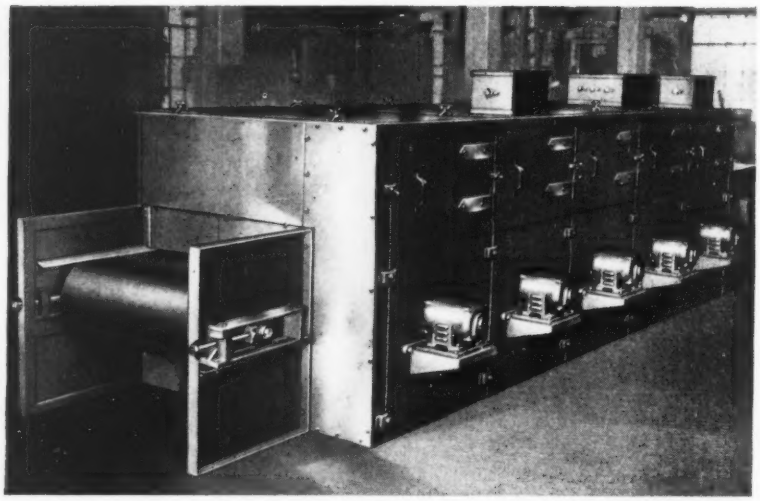
THE FLEXIBILITY OF A LAB DRYER
THE DEPENDABILITY OF A PRODUCTION DRYER



# SARGENT'S NEW PILOT PLANT DRYER

Each drying section, or any arrangement of groups of sections, can be zoned and controlled independently to provide widest possible variation of temperature, humidity, etc., where needed. Production technique and settings are determined accurately, transferred to the production dryers without need for adjustment. Additional sections are added easily and quickly at your plant. They are delivered as a complete unit with motor, fan, heating coils and conveyor in place. Compact, made in two sizes, the smaller being only 4'-0" high and 3'-9" wide. Uses gas, electricity or steam for heating element. Simple adjustment to regulate conveyor speed. Fully instrumented, has all necessary controls and recording charts. It's a little giant of versatility — invaluable in the modern, cost-conscious pilot plant. Let us give you details.

**FOR:**

NATURAL
SYNTHETIC
RECLAIM
LATEX
PELLETS
RUBBER PRODUCTS
CHEMICALS

**FOR BETTER RUBBER PROCESSING**

Sargent Dryers for Lab, Pilot Plant, Production (Conveyor, Tray, Tunnel, Truck) — easiest, speediest to install . . . less time than any other dryer on the market. Also Sargent Automatic Feeds, Weighing Feeds, Mixing Feeds . . . Sargent's revolutionary NEW COOLERS . . . Special Rubber Processing Machinery.

**C. G. SARGENT'S SONS CORPORATION**

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PHILADELPHIA 19 — F. E. Wasson, 519 Murdock Road
CINCINNATI 15 — A. L. Merrifield, 730 Brooks Avenue
CHICAGO 44 — John Law & Co., 5850 West Lake St.
DETROIT 27 — Clifford Armstrong Co., 16187 Grand River Ave.
HOUSTON 17, TEX. — The Alpha Engineering Co., Box 12371
CHARLOTTE, N.C. — D. H. Caldwell Co., 2009 Wood Dale Terrace
ATLANTA, GA — J. R. Angel, Mortgage Guarantee Building
TORONTO 1, CAN. — Hugh Williams & Co., 27 Wellington St. East


**Army Duck†**

| | | |
|---|---|---|
| 52-inch, 11.70 oz., 54x40 (8.10 oz./sq.yd.) | *yd.* | $0.5925 |

**Sheeting***

| | | |
|---|---|---|
| 40-inch, 3.15, 64x64 | *yd.* | .2175 |
| 3.60, 56x56 | | .185 |
| 52-inch, 3.85, 48x48 | | .2375 |
| 57-inch, 3.47, 48x48 | | .25 |
| 60-inch, 2.10, 64x64 | | .375 |
| 2.40, 56x56 | | .34 |

**Sateens***

| | | |
|---|---|---|
| 53-inch, 1.12, 96x60 | *yd.* | .645 |
| 1.32, 96x64 | | .575 |
| 57-inch, 1.04, 96x60 | | .615 |
| 58-inch, 1.02, 96x60 | | .7025 |
| 1.21, 96x64 | | .62 |

**Chafer Fabrics***

| | | |
|---|---|---|
| 14.40-oz./sq.yd. P.Y. | *lb.* | .74 |
| 11.65-oz./sk.yd. S.Y. | | .65 |
| 10.80-oz./sq.yd. S.Y. | | .68 |
| 8.9-oz./sq.yd. S.Y. | | .70 |
| 40-inch, 2.56, 35x25 | | .25 |
| 60-inch, 1.71, 35x25 | | .435 |

* Net 10 days.
† 2% 10 days.

## News About People

*(Continued from page 875)*

**William S. Nordburg, Jr.,** has been named director, overseas projects, for Amoco Chemicals Corp., Chicago, Ill. In this newly created position Nordburg will be responsible for evaluating overseas opportunities for chemical activities. For the past two years he was director of licensing, research and development department, Standard Oil Co. (Indiana).

**Newton H. Tuthill** is now president of Bishop Mfg. Corp., Cedar Grove, N. J., and its subsidiary, Peters Mfg. Co., Wollaston, Mass., manufacturers of electrical insulating tapes and compounds, spot crown materials, and electrical cable tapes. **Pendennis W. Reed,** formerly president, becomes chairman of the board.

**Stanley Messing** has been named sales manager for the Minor Rubber Co., Inc., Bloomfield, N. J., molder and extruder of natural, synthetic, and silicone rubber products.

•

## W. Wallace Roff

W. Wallace Roff, 57, vice president and director of Whittaker, Clark & Daniels, Inc., New York, N. Y., died suddenly January 16 of a heart attack.

He was with Whittaker, Clark & Daniels for 42 years, having started as an office boy and later becoming sales representative, sales manager, and vice president.

Mr. Roff was active in the New York Rotary and was a past master of Kane Lodge F & A M, West Orange, N. J., and a member of the Newark Orpheus Club.

He is survived by his wife, three sons, and three grandsons.

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## SITUATIONS OPEN

### RUBBER DEVELOPMENT TECHNOLOGIST

**Rubber technologist with compounding and physical testing experience to work in rubber laboratory engaged in technical service, research and development. Work is directed toward the use of zinc oxide in synthetic and natural rubber products. Laboratory is well equipped with modern compounding, electronic, and physical testing equipment. Progressive management encourages original work and professional development. Salary commensurate with training and experience.**

*Write to:*

**ROBERT G. REDELFS, Technical Coordinator**
**c/o St. Joseph Lead Company**
**P. O. Box 97, Monaca, Pa.**

### SENIOR RESEARCH CHEMIST

Challenging opening on San Francisco Peninsula. Degree in Chemistry or Chemical Engineering. Five to ten years' experience in rubber compounding and production. Record of development in precision molded rubber products. Salary open. Liberal benefits. Replies confidential. Send résumé to Box No. 2419, care of RUBBER WORLD.

### CHIEF CHEMIST—COMPOUNDER

Rapidly expanding precision molded goods mfr. wants Chief Chemist with experience in high-temperature fuel and oil-resistant stocks. Address Box No. 2420, care of RUBBER WORLD.

### PRODUCT DEVELOPMENT

Rubber and Plastics. Chemist or chemical engineering graduate. Some rubber experience necessary. Opportunity for widely varied individual creative work. Send résumé and salary desired to: E. L. Bixby, GOODALL RUBBER CO., Trenton 4, N. J.

### MATERIALS & PROCESS RESEARCH CHEMISTS

**Research minded, medium-sized company, long recognized as the leader in its field, offers positions in its expanding Materials and Process Research Department. Background experience in all elastomer compounding and development, including polyurethanes, and/or rubber-metal bonding, desirable. Chemistry or Chemical Engineering education required as well as ability to write reports and instruct others. Modern plant located in progressive community. New laboratories with excellent research facilities. Excellent housing available within 10 minutes' driving distance. Call collect or write for application form.**

**LORD MANUFACTURING COMPANY**
**Personnel Department**
**Erie, Pennsylvania**

### RUBBER CHEMIST

Long-established Rubber Reclaiming Company has opening for Rubber Chemist. This is an excellent opportunity created by promotion. Experience in general compounding and/or processing for product development desirable, but not essential. Pension, hospitalization, and other benefit programs above average. Salary commensurate with experience. Send résumé in confidence to Box No. 2421, care of RUBBER WORLD.

LATEX AND CUT THREAD TECHNOLOGIST TO HEAD NEW department and also Sales and Consultant help wanted on these products. Address Box No. 2422, care of RUBBER WORLD.

RUBBER HOSE COMPOUNDER AND DEVELOPMENT ENGINEER A large eastern manufacturer of hose has an opening for a man experienced in rubber compounding and also an opening for a man experienced in factory processing and development of hose. Submit detailed résumé to Personnel Manager, ELECTRIC HOSE & RUBBER COMPANY, Wilmington 99, Delaware.

## SITUATIONS OPEN (Cont'd)

### ADHESIVE SALES ENGINEER

Experience—with following—for line of Structural and Pressure-Sensitive Adhesives of Elastomeric and Resin Type. Must be able to program and follow through with Sales effort on Sales and Technical service to Industry supported by cooperation of Modern Research and Development Laboratory. Very attractive arrangements available to man who qualifies. Mail résumé to:

Stan L. Ostrenga
National Sales Manager
Mystik Adhesive Products, Inc.,
2635 No. Kildare Ave.,
Chicago 39, Illinois.

### LATEX CHEMIST

Experience in dipped goods, extruded thread, paper treatment, flexible adhesives, etc., desirable. This will be an opportunity to do individual work that is varied and challenging in our Cambridge Customer Development Laboratory.

GENERAL LATEX & CHEMICAL CORPORATION
666 MAIN STREET
CAMBRIDGE 39, MASSACHUSETTS

### PLANT SUPERINTENDENT

Midwest rubber company needs man familiar with compounding, open milling, calendering, and extruding. Supervisory experience desirable. Growth opportunity with expanding company. Address Box No. 2430, care of RUBBER WORLD.

### TECHNICAL SALES—ISOCYANATES

Young Ch.E. or chemist wanted for field sales work requiring some understanding of rubber and plastic technology. Training and introductory period will lead directly to self-supervising field selling. We require integrity, intelligence, and energy in that order, and offer a permanent position with growth potential. Starting salary $6,500 to $9,000 for two to five years, experience. Please send résumé to: Richard Kithil, Vice President, The Carwin Company, North Haven, Connecticut.

### RUBBER MOLD ENGINEER

Large Eastern precision molder of rubber and plastics has opening for an experienced rubber mold engineer with project experience, and ability to estimate, design, and develop. Salary open, growth potential, attractive surroundings. Send résumé in strict confidence to Box No. 2431, care of RUBBER WORLD.

**The Classified Columns of**

**RUBBER WORLD**

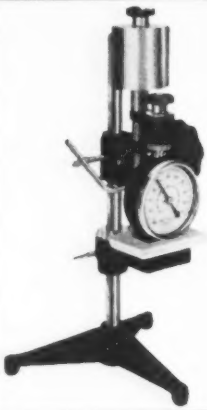
**bring prompt results at low cost.**

## SITUATIONS WANTED

PLANT ENGINEER DESIRES TO RELOCATE EAST OR SOUTHeast part of the country. Full knowledge of process equipment and mold design. Desires managerial duties of production in medium or small rubber company. 3 years' college; 10 years of experience; 37 years old. Address Box No. 2423, care of RUBBER WORLD.

CHEMIST AND ENGINEERING TECHNOLOGIST—B.S., Ph.D. level. Long experience in rubber, latex, resins, plastics, and related materials. Pressure-sensitive development and manufacture. Chemical development, engineering, and mechanical experience. Administrative and consulting experience. Patents registered. Mature age. Full time connection or consulting basis considered. Eastern location preferred. Address Box No. 2426, care of RUBBER WORLD.

INDUSTRIAL ENGINEERING MANAGER (B.S.) SEEKS POSItion leading to plant Manager. Small to medium-sized manufacturer. Address Box No. 2427, care of RUBBER WORLD.



RUBBER HARDNESS
ORIGINAL SHORE
DUROMETER
ASTM D676 AND ASTM D1484

Various models for testing the entire range of hardness from elastomeric to rigid. Available in quadrant or round dial case. May be used free hand or on table top OPERATING STAND WITH DEAD WEIGHT (left).

THE SHORE INSTRUMENT & MFG. CO., INC.
90-35 VAN WYCK EXP., JAMAICA 35, N.Y.

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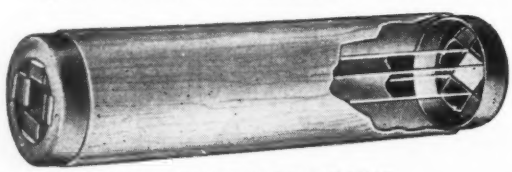

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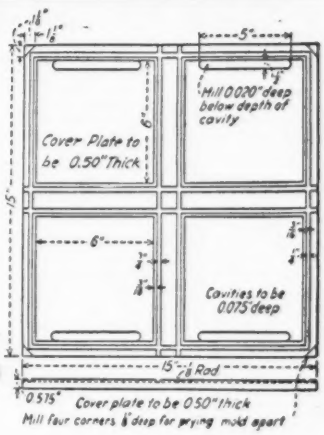


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A

Albert, P. E., & Son ..... 888
American Hard Rubber Co. ..... 889
Archer Rubber Co. ..... 889

B

Bolling, Stewart, & Co., Inc. ..... 884

C

Cabot, Godfrey L., Inc. ...Insert 853-858
Carter Bell Mfg. Co., The ..... 770
Cary Chemicals, Inc. ..... 764
Claremont Flock Corp. ..... 782
CLASSIFIED
ADVERTISEMENTS ..... 887-889
Cleveland Liner & Mfg. Co.,
The ..... Third Cover
Columbia-Southern Chemical
Corp. ..... Insert 760, 761
Columbian Carbon Co. ..... 780, 781
CONSULTANTS & ENGINEERS ... 794
Continental Carbon Co. ..... 788, 789
Cylinder Manufacturing Co. ..... 888

D

Dow Corning Corp. ..... 791
DPR Incorporated, A Subsidiary of
H. V. Hardman Co. ..... 790
du Pont de Nemours, E. I., & Co.
Second Cover
Durez Plastics Division,
Hooker Chemical Corp. ..... 806

E

Eagle-Picher Co., The ..... 794
English Mica Co., The ..... 890
Enjay Co., Inc. ..... 772; Insert 773

F

Farrel-Birmingham Co., Inc. ..... 787
Firestone Synthetic Rubber & Latex
Co. ..... 767

G

General Dyestuff Co. .....Insert 795
General Tire & Rubber Co., The
(Chemical Division) ..... 776, 777
Genseke Brothers ..... 801
Gidley Laboratories, Inc. ..... 794
Glidden Co., The .....Insert 867
Goodrich, B. F., Chemical Co. ..... 749
Goodrich-Gulf Chemicals, Inc.
Insert 841-844
Goodyear Tire & Rubber Co., Inc.,
The (Chemical Division)
Insert 757-758; 759

H

Hale & Kullgren, Inc. ..... 794
Hall, C. P., Co., The ..... 800
Harwick Standard Chemical Co. ... 779
Hoggson & Pettis Mfg. Co., The ... 889
Holmes, Stanley H., Co. ..... 768
Hooker Chemical Corp.,
Durez Plastics Division ..... 806
Houdry Process Corp. ..... 805
Huber, J. M., Corp. ..... 812

J

Johnson Corp., The ..... 755

K

K. B. C. Industries, Inc. ..... 889
Kenrich Petrochemical, Inc. ..... 796
Kingsbacher-Murphy Co. ..... 790

L

Litzler, C. A., Co., Inc. ..... 769

M

Marbon Chemical Division of
Borg-Warner Corp. ..... 763
Motch & Merryweather Machinery
Co. ..... 868
Muehlstein, H., & Co., Inc. ..... 765

N

National Rosin Oil Products, Inc. ... 889
Naugatuck Chemical Division of
U. S. Rubber Co. ..... 783, 784, 785
Neville Chemical Co. ..... 775

P

Phillips Chemical Co. ..... 752

R

Rare Metal Products Co. ..... 890
Richardson, Sid, Carbon Co. ..... 892
Richardson Scale Co. ..... 804
Roebling's, John A., Sons Corp.
Insert 771
Ross, J. O., Engineering, Division
of Midland-Ross Corp. ..... 797

S

Sargent's, C. G., Sons Corp. ..... 886
Scott Testers, Inc. ..... 782
Shaw, Francis, & Co., Ltd. ..... 807
Shell Chemical Co., Synthetic
Rubber Division ..... 810, 811
Shore Instrument & Manufacturing
Co., Inc., The ..... 888
Silicones Division, Union Carbide
Corp. ..... 885
Sinclair-Collins Valve Co., The ..... 762
Snell, Foster D., Inc. ..... 794
South Texas Tire Test Fleet, Inc. .... 792
Spadone Machine Co., Inc. ..... 766
Stamford Rubber Supply Co., The .. 804

T

Texas-Butadiene & Chemical Corp. .. 778
Texas-U.S. Chemical Co. ..Insert 798, 799
Thiokol Chemical Corp. ..... 793
Tress Chemical Corp. ..... 794

U

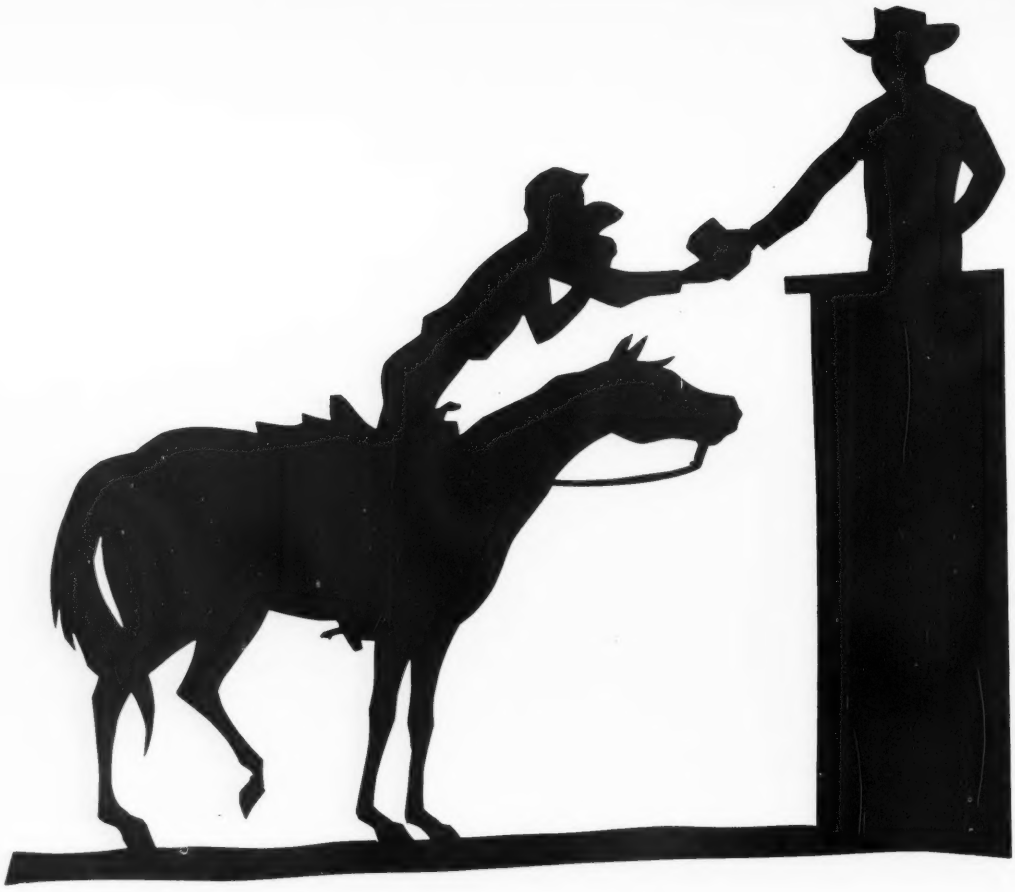
Union Carbide Corp., Silicones
Division ..... 885
United Carbon Co., Inc. ..... 808, 809
United Rubber Machinery Exchange 888
U. S. Rubber Reclaiming Co.,
Inc. ..... 802, 803
Universal Oil Products Co. ..Back Cover

V

Vanderbilt, R. T., Co., Inc. ..... 814

W

Wellington Sears Co. ..... 786
Williams, George A., & Son ..... 792
Witco Chemical Co., Inc. ..... 788, 789
Wood, R. D., Co. ..... 774



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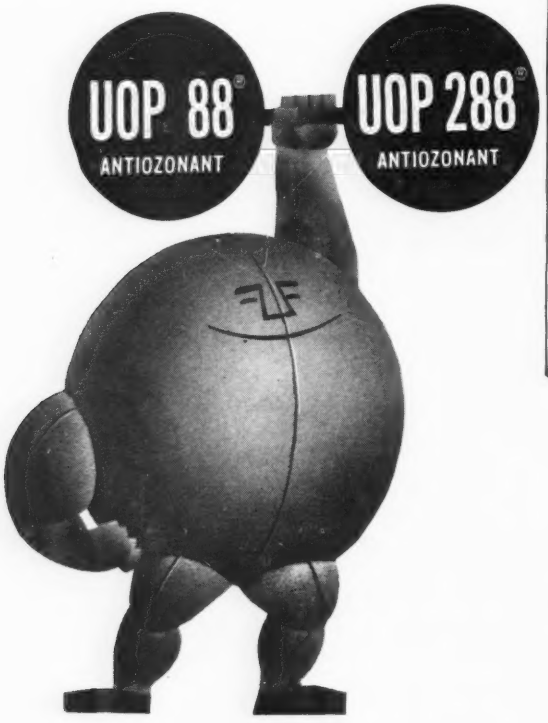

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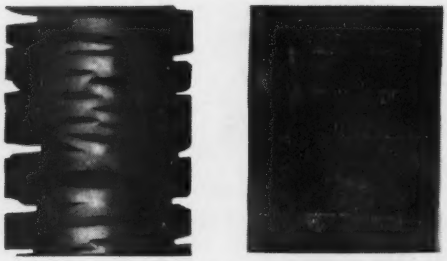

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